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Test-Retest Reliability and Validity of the Feeding Your Preschooler Questionnaire for Low-Income Hispanic Populations.

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by

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Dedication

To my husband Carlos and to our sons Carlos, Alexander and Diego Hernandez-Ojeda, may this work inspire you to accomplish all the goals you set throughout your lives.

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Test-Retest Reliability and Validity of the Feeding Your Preschooler Questionnaire for Low-Income Hispanic Populations.

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This methods-oriented dissertation focuses on the psychometric evaluation of the Feeding Your Preschooler Questionnaire (FYPQ) designed to assess the eating habits and diet quality of young children. Parental proxy reports (n=135) were obtained through pen and pencil administration of the FYPQ and an in-person interview using a 24- hour food recall (24HR).Test-retest reliability (n=82) was determined using a repeated measures design with Wilcoxon signed rank tests and Spearman correlations for the food frequency questionnaire (FFQ) portion of the survey, parental self-efficacy, parental role modeling, parental practices, and parental perception of child food preference regarding fruits and vegetables scales. Test-retest reliabilities ranged from r=.53 for water to r=.84 for vegetables for the FFQ and from r=.64 for role modeling to r=.71 for parental perception of child preference for the psychosocial measures. Concurrent construct validity (n=107) was examined with a cross-sectional study design using the Wilcoxon signed rank test, Spearman correlations, and cross-classification analysis into quartiles of food group

intakes. Spearman's correlations between the FFQ and the 24HR were .46 for milk, .22 for fruit, .22 for vegetables, .11 for grains and .07 for protein. Cross-classification analysis revealed that 29% of children were classified in the same quartile and 69% in the same or within one quartile, and gross misclassification ranged from 2% to 10%. Nomological validity was examined using weighted least squares regression. Two regression analyses with fruit and vegetable intake on first the FFQ and second the 24HR as the dependent variable examined the influences of psychosocial environmental predictors and food insecurity. The FFQ regression model explained 28% ($p<.05$) of the variance in fruit and vegetable intake, with the significant predictors of parental role modeling and food insecurity. The 24HR regression analysis predicting fruit and vegetable intake explained 11% ($p<.05$), with parental perception of child preference and parental role modeling as significant predictors. In summary, the FYPQ demonstrated good test-retest reliability. The study provides evidence of concurrent validity for the FFQ for assessment of milk consumption and fruit and vegetable variety in preschool children's diets and of nomological validity in the prediction of fruit and vegetable consumption.

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Chapter 1: Introduction

The prevalence of childhood overweight is a growing public health concern in the United States. The National Health and Nutrition Examination Surveys (NHANES) reported a serious increase in obesity rates among preschool children from 5% in the 1970's to 13.9% in the 2003-04 survey (Ogden, Carrol, & Flegal 2008; Ogden, Carroll, Curtin, McDowell, Tabak, & Flegal, 2006; Ogden, Flegal, Carroll, & Johnson, 2002). Texas reports are similarly alarming. Texas ranked sixth in the nation for childhood obesity in 2004 according to the Youth Behavior Surveillance System. The School Physical Activity and Nutrition Survey (SPAN) found that Texas children had higher rates of overweight and obesity than the nation's average and that Hispanic children were disproportionately affected (Hoelscher, Day, Lee, Frankowski, Kelder, & Ward, 2004). As for Texas toddlers, the Women's Infants and Children's Supplemental Nutrition (WIC) program reported an obesity prevalence in low-income toddlers aged 2 to 5 of 21.3%, with rates higher among Hispanic participants (22.7%) (DSHS, 2008).

The high prevalence of overweight is of concern because of the associated health consequences and the substantial tracking of overweight from early childhood to adolescence (Jebb & Moore, 1999; Ritchie, Ivey, Woodward-Lopez, & Crawford, 1993) and adulthood (Serdula, Ivery, Coates, Freedman, Williamson, & Bayers, 1993). Approximately 30% of overweight toddlers will remain overweight their entire lives (Ogden et al., 2006). Chronic diseases such as type II diabetes, hypertension, hypercholesterolemia and orthopedic abnormalities that were once adult onset diseases are now present in young children (Dabelea, Pettitt, Jones, & Arslanian, 1999).

There is a strong relationship between what young children eat, obesity and ultimately their health outcomes. By the time a child is 3 or 4 years old, many believe that food intake is no longer hunger-driven, but rather influenced by a child's response to environmental cues. The physical environment and a variety of family and social factors influence a child's eating behavior (Patrick & Nicklas, 2005). Young children depend on their caregivers to provide them with the food they eat. Among the list of factors that have been postulated to affect the food intake of young children are availability and accessibility (Hearn, Baranowski, Baranowski, Doyle, Smith & Lin, 1998; Kratt, Reynold, & Shewchuk, 2000), the child's food preference (Neumark-Sztainer, Wall, Perry, & Story, 2003), portion size offered (Rolls, Engell, & Birch, 2000), cultural values (Sherry et al., 2004), parental beliefs and practices (Baughcum, Powers, Johnson, Chamberlin, Deeks, & Jain, 2001), mealtime structure, and parental feeding style (Faith, Scanlon, Birch, Francis, & Sherry, 2004).

Increased fruit and vegetable consumption, the primary topic of this study, is an aspect of eating that has received considerable attention recently in light of the obesity epidemic. Fruits and vegetables are low in calories, nutrient dense and high in fiber and have numerous health benefits; yet Americans eat less than the recommended amounts. The United States Department of Agriculture (USDA) and US Department of Health and Human Services' food guide pyramid recommends that children aged 2 to 6 consume 2 to 4 cups of fruits and vegetables (1 - 1.5 cups of fruit and 1 - 2.5 cups of vegetables) or, depending on the child's age, 3 - 8 servings of fruits and vegetables (Note: for a child aged 2 - 4, a serving equals 1/3 cup; for a child 4 - 8, a serving size is equal to ½ cup of fruits and vegetables) for diets requiring 1000-1800 Kcal diet which is adequate for this

age group. Despite this recommendation, research has found that preschool children do not consume enough fruits and vegetables. Dennison and colleagues found that 40% of 2-year-old children and 50% of 5-year-old children consumed <2 servings/day of fruits and vegetables (Dennison, Rockwell, & Baker, 1998). The Feeding Infants and Toddlers Study (2004) reported that on a given day, 25% to 30% of infants and toddlers aged 9 to 24 months consumed no fruit and 20% to 25% consumed no vegetables. Of those who consumed vegetables, 25% ate them as French fries (Briefel, Reidy, Karwe, Jankowski, & Hendricks, 2004). In the Texas study using the Feeding Your Toddler and Young Child Questionnaire, fewer than half (48.5%) of the children aged 1-5 years of age ate the recommended average of 5 servings of fruit and vegetables a day (Evans, Seth, Harris, Loyo, Spaulding, & Gottlieb, 2008, unpublished data).

Obesity is especially a concern among low-income families. Many low-cost foods are calorie-high and nutrient-poor (Caballero, 2005). Food assistance programs, such as WIC, aim to supplement the diets of young children with vouchers for nutritious foods and provide nutrition counseling and education (USDA, 2005a). To evaluate the effectiveness of such programs in promoting healthy diets in low-income young children, instruments must be available that can be used to assess food intake and other parental and child factors related to child eating patterns. Because of the diversity of participants enrolled in food assistance programs (Kresge, 2003; Olander, 2007), instruments need to be appropriate for populations with varied levels of education and literacy.

Age-appropriateness is also important. Many instruments have been developed to assess dietary intake in adults such as Willet's and Block's food frequency questionnaire. Food intake methods include seven-day food diaries, 24-hour recalls (administered singly

or multiple times), and food frequency questionnaires (FFQs). The analysis of these methods typically focuses on macro and micronutrients with some attention on food preparation methods. While 24-hour recalls are considered more precise in measuring intake on a given day, FFQs are often used in epidemiological and evaluation research because they provide a good estimate of average food intake over time, can be easier to administer, and allow for comparisons across groups (Willett, 1998).

A few semi-quantitative FFQs have been created for use with school age children and adolescents (Rockett & Colditz, 1997; Willett, Sampson, Stampfer, Rosner, Bain, & Witschi, 1985). Many of these FFQs are adapted from adult versions and can be cumbersome to administer, particularly with participants with lower literacy levels. There are few validated FFQs that are appropriate for parents of preschool-age children, that are available both in English and Spanish languages, or that reflect the dietary patterns of Hispanics.

Because FFQs are designed to assess only usual dietary intake over a certain period of time, it is often necessary to supplement them with other instruments that can provide more comprehensive data on other factors related to individuals' food intake (e.g., environmental and behavioral factors). In terms of children's diets, parents control many features of the home nutrition and physical activity environments in which their children are raised. For example, parents can influence children's dietary behaviors by manipulating the environment, behaving in specific ways, and providing certain foods within the home. As such, parents are instrumental in facilitating or hindering the healthful dietary and physical activity behaviors of their children (Hertzler, 1983; Laskarzewski, Morrison, Khoury, Glatfelter, Larsen, & Glueck, 1980; Sallis & Nader,

1988; Satter, 2000). Recognizing the many factors that contribute to diet, the Institute of Medicine (IOM, 2002) recommended that nutrition assessment in food assistance programs such as WIC take a more holistic approach. The U.S. Department of Agriculture Food Nutrition Services acted on this recommendation by developing new guidelines for Value Enhanced Nutrition Assessment, that shift away from a focus on micronutrients to nutrition-related behaviors and parental concerns (USDA, 2007). Therefore, instruments that assess both dietary intake and environmental and behavioral influences on dietary intake need to be developed and validated for use among diverse young populations. This dissertation aims to validate and assess the test-retest reliability of a food frequency questionnaire and of a compiled environmental and behavior survey of parental feeding practices of low-income Hispanic parent's of preschool children.

The "Feeding Your Toddler and Young Child Questionnaire" was developed by the University of Texas at Austin Nutrition Education Team (UTNE) in both English and Spanish versions as part of an ongoing evaluation contract with the Texas Department of State Health Services WIC program (Seth, Evans, Harris, Loyo, Ray, Spaulding, & Gottlieb, 2007). The "Feeding Your Toddler and Young Child Questionnaire" measures the usual food intake patterns of young children by means of a food frequency questionnaire and items from the USDA food check list. It also assesses the contextual and behavioral aspects by measuring child food preferences, parental self-efficacy, beliefs, knowledge, and motivation to feed their children healthful foods, parenting feeding practices and demographic variables. A modified version of the "Feeding Your Toddler and Young Child Questionnaire" will be tested for this dissertation project. The full survey was not used because other environmental and contextual variables from other

sources were compiled and believed to be of greater interest and influence. The survey tested in this dissertation includes the preschool food frequency questionnaire (FFQ), an expanded child food preference section, parental self-efficacy and specific items regarding the home environment, including accessibility and availability of fruits and vegetables, parental role modeling and parental feeding practices related to fruit and vegetable intake. The "Feeding Your Toddler and Young Child Questionnaire" and the modified version tested in this dissertation "Feeding Your Preschooler Questionnaire" (FYPQ) are appropriate for use with parents and caregivers of children ages 2-5 with a broad range of education and literacy levels and have the ability to capture dietary patterns for both Hispanics and non-Hispanics.

The FFQ was developed based on a review of existing questionnaires including the Block FFQ (Block, 2003) and the Harvard Children's FFQ (Rockett et al., 1997), habitual food intake of Texas WIC clients, extensive field testing, and a large scale pilot test. Unlike most FFQs, the FFQ tested in this dissertation asks about child food intake in the previous seven days because field testing demonstrated that parents had difficulty conceptualizing average intake over longer periods of time. Two additional sets of items from the USDA food behavior checklist are used to assess milk and 100% juice intake (Townsend, Kaiser, Allen, Joy, & Murphy, 2003).

Validity and reliability testing of instruments that assess preschool children's food intake, child preference, parental influences (self-efficacy, parental practices, parental role modeling regarding fruits and vegetables) and home environmental determinants is needed to better understand the role of diet and behavior and their impact on obesity.

PURPOSE

This methods-oriented dissertation focuses on the psychometric evaluation of a survey designed to assess parental factors that are related to the eating habits and diet quality of preschool children.

This dissertation has three purposes. The first is to determine the test-retest reliability of the Feeding Your Preschooler Questionnaire, focusing on the FFQ portion of the questionnaire, the parental self-efficacy to feed children fruits and vegetables scale, the parental role modeling, parental practices, and the parental perception of child food preference scales. Second, construct validity of the preschool food frequency questionnaire will be assessed against a 24-hour food recall (24HR). The third is to evaluate the nomological construct validity of the Feeding Your Preschooler Questionnaire for fruit and vegetable consumption as measured by both the FFQ and the 24HR.

The psychometric testing of the Feeding Your Preschooler Questionnaire (FYPQ) will provide support for using the FYPQ questionnaire as an assessment tool, which in turn would allow dietary assessment, measurement of influences of culture and behavioral determinants on eating habits and food preferences, and evaluation of the impact of food assistance on the dietary intake and food related environment of young children over time. In addition, this non-invasive method for assessing nutritional status during childhood would allow a better understanding of how parental psychosocial factors can help shape the direction of nutrition counseling and education of health promotion programs and their effectiveness.

In addition, the validation of the FFQ against a 24HR would strengthen the impact of the preliminary findings from a cross-sectional study that compared dietary intake and child feeding-related beliefs and behaviors among WIC children and parents compared to non-WIC children and parents (Seth et al., 2007). The aforementioned study found that children in WIC consume more fruits and vegetables than those not on WIC and that parental self-efficacy to feed the child fruit and vegetables is one of the strongest predictors of child fruit and vegetable intake (Seth et al., 2007).

There are many types of construct validity. This dissertation will employ nomological validation of the psychosocial constructs related to the preschool child's fruit and vegetable intake. Nomological validity refers specifically to whether the measure relates to measures of other constructs in a way that makes sense logically according to a theory in which the construct being validated is embedded. The idea is that theories have networks of constructs that relate to each other. In this case Social Cognitive Theory predicts that determinants such as parental self-efficacy to feed children fruits and vegetables, parental practices, parental role modeling and access and availability of fruits and vegetables form part of a network and this network should be related to the preschool child's consumption of fruit and vegetables. If they are related to fruit and vegetable intake as predicted by theory, there is evidence for nomological validity (Cronbach & Meehl, 1955).

According to Bandura's Social Cognitive Theory (SCT) (1986), behavior may be explained and predicted by several key constructs, such as self-efficacy and observational learning. A behavior such as feeding a young child involves parental self-efficacy, the confidence to perform a behavior despite the barriers one might need to overcome to do

so. A parent therefore will have to acquire skills to feed his or her child properly despite the numerous challenges of parenting. The child on the other hand will have the opportunity to experience what Bandura defined as observational learning, which occurs when the child watches the actions of another person, in this case the parent or another child, and the reinforcements that the person receives. Role modeling and parental practices, as part of the child's environment, will provide observational learning opportunities and vicarious experience (Glanz, Rimer, & Lewis, 2002).

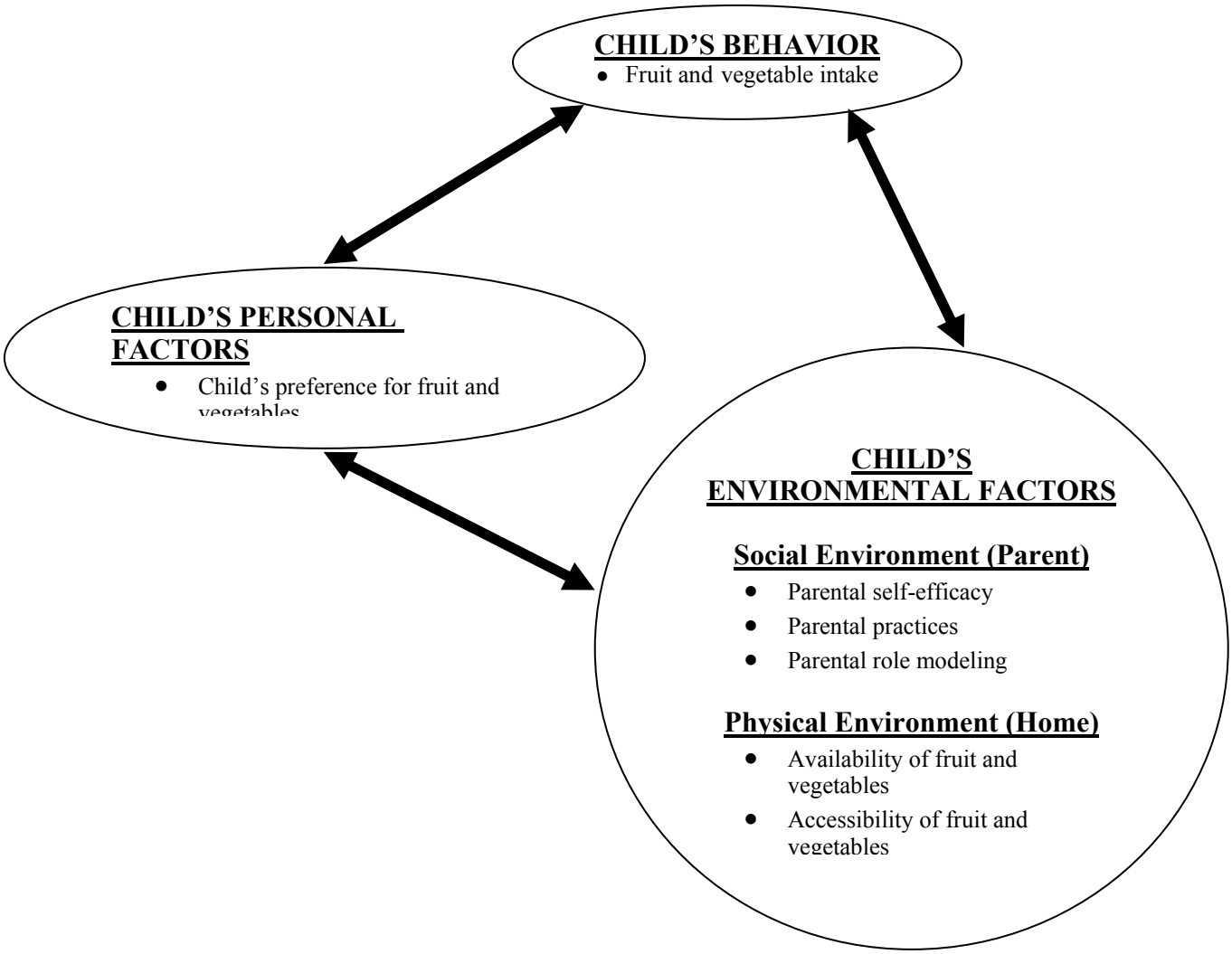
Personal factors such as food preferences are also thought to be determinants of eating behavior (Birch & Sullivan, 1991; Contento, 1991). Preference involves liking or choosing something over something else. Research has demonstrated that food preference is a significant predictor of consumption (Domel, Thompson, Davis, Baranowski, Leonard, & Baranowski, 1996). Food acceptance patterns are developed early in life (Birch & Fisher, 1998). The development of food preference can be explained by Rozin's (Rozin, 1980) concept of food neophobia, avoidance or reluctance to taste a new food and by food exposure, to the degree that repeated exposure can overcome initial dislike of foods (Birch & Marlin, 1982).

Whether or not the food is available or accessible are also important predictors of child eating behavior. In general, children will choose to eat what they are accustomed to and they tend to eat what is made available to them in their homes (Birch & Marlin, 1982; Hearn et al., 1998; Kratt, Reynold, & Shewchuk, 2000). Therefore, the foods to which children are routinely exposed help shape their preference and consumption (Birch, 1992; Birch, McPhee, Shoba, & Pirok, 1987; Hearn et al., 1998; Hendy & Raudenbush, 2000; Wardle, Herrera, Cooke, & Gibson, 2003). Parents are responsible

for making food available to their children and therefore have a profound impact on their children's food preference and consumption (Patrick & Nicklas, 2005). Accessibility also plays a strong role in consumption, according to Baranowski and colleagues (1999). When food is made accessible and ready to be eaten, children are more likely to eat it. For example, consumption of fruit and vegetables is higher when these are cut up and made accessible (i.e., in child's reach).

The following figure uses variables from Social Cognitive Theory to describe the relationship among the child, the child's behavior (fruit and vegetable intake), and his environment. This model of preschool child feeding acknowledges the importance of the physical and the social environment. The term environment in this model simply means the space outside the person (Glanz, Rimer, & Lewis, 2002). The social environment is represented by the interpersonal relationship between the child and his parent or caregiver and includes the following constructs: parental self-efficacy, parental role modeling, and parental practices that influence the child's eating behavior. The physical environment is composed of availability and accessibility to food in the home. The personal factors are represented by child preference for fruit and vegetables as described by their parent or caregiver and thus represent the parental perception of the child's food preference.

Figure 1. Model of Preschool Child Feeding



Adapted from: Pajares (2002). Overview of Social Cognitive Theory and of Self-efficacy. 06-08-08. From http://www.emory.edu/EDUCATION/mfp/eff.html.

HYPOTHESES

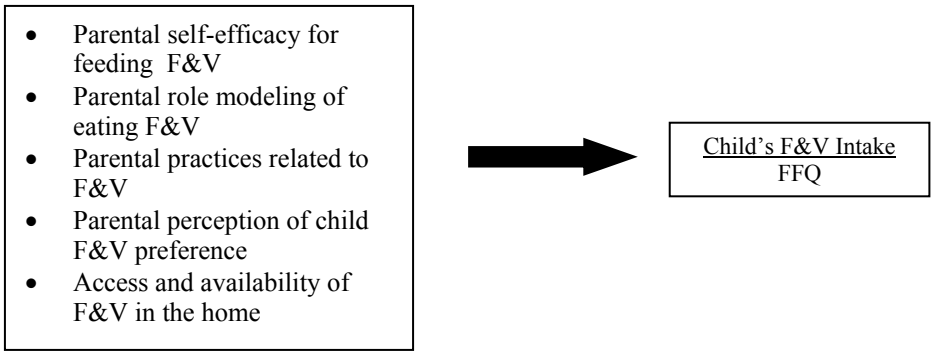
Hypothesis 1: The scales on the FYPQ are each significantly correlated with the same scales when comparing data collected at two different time points, 2 to 4 days later, showing test-retest reliability.

Time 1		Time 2
FFQ (food groups)	↔	FFQ (food groups)
Parental self-efficacy for feeding F&V	↔	Parental self-efficacy for feeding F&V
Parental role modeling of F&V	↔	Parental role modeling of F&V
Parental practices related to F&V	↔	Parental practices related to F&V
Parental perception of child F&V preference	↔	Parental perception of child F&V preference

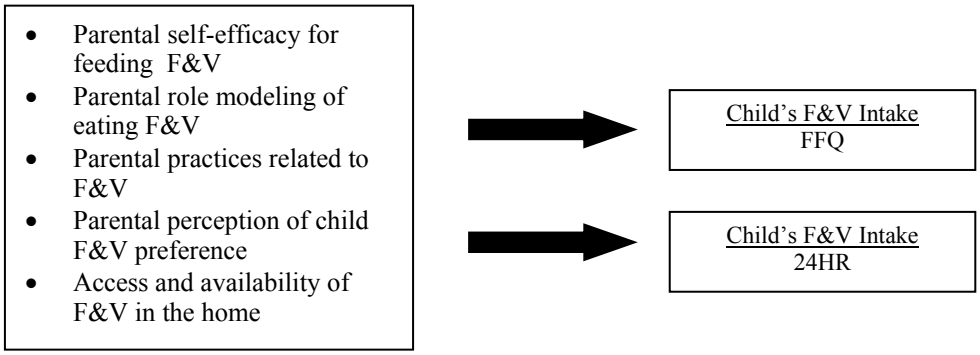
Hypothesis 2: Children's usual food consumption measures on the FFQ are significantly correlated with the corresponding eating behavior as measured by a 24-hour dietary recall, demonstrating construct validity of the FFQ.

FFQ		24HR
Milk	↔	Milk
Fruit	↔	Fruit
Vegetables	↔	Vegetables
Protein	↔	Protein
Grains	↔	Grains
	↔	
Fruits and vegetables		Fruits and vegetables

Hypothesis 3: Physical and social environment and child personal factors are independently significantly related to child's fruit and vegetables intake as measured by the FFQ, demonstrating nomological validity.



Hypothesis 4: Fruit and vegetable intake as measured by the 24HR and the FFQ are equally predicted by the psychosocial determinants of eating behavior.



SIGNIFICANCE OF STUDY

Hypothesis 1 was designed to determine the test-retest reliability of the FYPQ instrument. This instrument is appropriate for use with parents with a broad range of education and literacy levels. Hypothesis 2 will validate the FFQ, proposed to assess by parental proxy the intake of preschool-aged children's diets over a seven day period using a 24HR. Hypothesis 3 and 4 will test the nomological validity of the FYPQ by comparing how well fruit and vegetable intake measures are predicted by the physical and social environment, specifically (a) the fruit and vegetable accessibility and availability index, (b) parental perception of child food preference, (c) parental practices, (d) parental role modeling and (e) parental self-efficacy related to fruit and vegetables. These studies will add to the available literature of parental preschool children's feeding behaviors and will complete the psychometric evaluation of the FFQ and FYPQ assessment tools.

DEFINITION OF TERMS

24-hour food recall- An open-ended dietary assessment method in which an individual is requested to remember all food and beverages consumed in a defined 24-hour period (Bauer & Sokolik, 2002).

Accessibility- The degree to which obtaining food is made easy and ready to be eaten (Patrick & Nicklas, 2005).

Availability- Foods that are available in the home (Kratt et al., 2000).

Construct validity- Provides evidence of a test or measure behaving as the definition of the construct predicts that it should (Krathwohl, 1998).

Content Validity- Used to show how well a measure covers the domain of a subject it is designed to measure (DeVellis, 2003).

Environment- Everything external to the person (Pajares, 2002).

Feeding Your Preschool Child Questionnaire (FYPQ)- A questionnaire that assesses preschool children's intake and factors involved in the parent-child feeding relationship.

Food frequency questionnaire- A dietary assessment tool that is used to measure a person's food intake over a longer period of time, usually one week to a year. The FFQ measures how frequently a certain food is eaten in a given time frame. It does not allow the assessment of meal patterns (Willett, 1998).

Food preference- The acceptance of one food item over another (Birch, 1999) or expression of the liking of a food item.

Internal consistency reliability- Statistic concerned with the homogeneity of the items within the scale. A scale is internally consistent to the extent that the items are highly intercorrelated (DeVellis, 2003).

Nomological network- an interlocking system of laws which constitute a Theory (Cronbach & Meehl, 1955).

Nomological Validity- refers specifically to whether a measure relates to measures of other constructs in a way that makes sense logically according to a theory in which the constructs are embedded (Wiggins, 1973).

Parent practices- The actions parents engage in either before or during the feeding process, such as having the child eat his vegetables before he can have dessert.

Parental role modeling- refers specifically to the example set by the parent's eating behavior, which provides an observational learning opportunity and repetition of the behavior by his/her child.

Physical environment- Elements, such as temperature, size of the room, and availability of food items, that describe the physical aspects of the environment (Glanz et al., 2002).

Preschool food frequency questionnaire (FFQ)- A 7-day food frequency questionnaire designed specifically for children aged 1 to 5.

Reliability- "Evidence of consistency of measurement over items, over tests or over time" (Krathwohl, 1998 p.691).

Role model- A person who functions as an example for others to imitate (Corsini, 2002). Person who provides others with a conduct pattern to follow.

Self-efficacy- The confidence that an individual possesses in performing a given behavior and in overcoming barriers to that behavior (Bandura, 1986).

Social Cognitive Theory (SCT)- A framework for understanding and modifying health habits. Behavior is viewed as a dynamic process that interacts with personal factors and environment, all of which simultaneously influence each other (Glanz et al., 2002; Pajares, 2002).

Social environment- Represented by interpersonal relationships (Glanz et al., 2002).

Test-retest reliability- The temporal stability of a measure, which is how constant scores remain from one administration to the next (DeVellis, 2003).

Validity- "Evidence based judgment that a test measures what it is intended to measure."(Krathwohl, 1998, p. 694) There are many kinds of validity. This dissertation focuses on two different types: convergent validity and predictive validity.

Chapter 2: Review of the Literature

The purpose of this chapter is to provide an overview of the literature on food intake measures available for preschoolers, to present the importance of developing valid and reliable instruments measuring how and what preschool children are eating, to discuss test-retest reliability and types of validity, specifically construct validity. A brief discussion of Social Cognitive Theory is addressed in order to provide a theoretical framework for the construct validity section of this dissertation and is used to ascertain the nomological validation of the preschool feeding instrument.

DIETARY DATA COLLECTION METHODS

Four methods available to collect dietary information on food and nutrient intake have been identified: the 24-hour food recall (24HR), food frequencies questionnaires (FFQ), dietary logs or food records, and diet histories. There is no single data collection method available that can be used for food consumption surveys, epidemiological studies of nutrition status, and clinical investigations. The selection of the data collection method depends on the purpose of the study, the population of interest, the level of detail needed, the period of interest and the available resources with which the study is conducted (Ziegler, Briefel, Clusen, & Devaney, 2006). For the purpose of this dissertation, the 24HR and the FFQ will be described in detail. Description and a summary of the other two types of dietary assessment methods can be found elsewhere (Bauer & Sokolik, 2002; Mahan & Escott-Stump, 2004; Willett, 1998; Ziegler et al., 2006).

24-Hour Dietary Recall (24HR)

The 24HR is an open-ended dietary assessment method in which an individual is requested to recall all food and beverages consumed in a defined 24-hour period (Bauer & Sokolik, 2002). It may be administered in person or by phone with similar results (Bogle et al., 2001; Buzzard et al., 1996; Morgan, Johnson, Rizek, Reese, & Stampley, 1987). The 24HR has the advantage of accommodating different levels of detail and diversity to address almost any research question. It also allows flexibility in the analysis procedure. Data can be analyzed by individual food, as well as by individual nutrients, by food groups or by meal (Willett, 1998).

The 24HR is a very labor intensive method, usually administered by a trained dietary interviewer. In the case of young children the interviewee is usually the parent or caretaker. Visual aids can be used to help respondents estimate quantities consumed (Johnson & Hankin, 2003; Ziegler et al., 2006). The information obtained during the interview is then coded either on a form or using a computer program. Direct coding with the use of automated software is also possible during the interview. This method has the advantage of the respondent specifying the information needed to clarify the coding needed for each response. The 24HR and its accuracy are dependent on memory recall of the interviewee. Therefore, the interviewer must have the skills necessary to put the interviewee at ease and to be able to probe for additional foods, food preparation methods, and brand name specifications depending on the level of detail sought (Ziegler et al., 2006).

A key advantage of this method is that the interviewee requires no training and that minimal effort is needed to provide the information requested by the interviewer.

Furthermore, although the processing of the information is time consuming, it is less time consuming than processing the data from a 3-7 day dietary record. 24HRs are useful for assessing average usual intakes of a large population and have been used in large dietary surveys (Gibson, 1998). A single 24HR, however, cannot account for day to day variation.

As mentioned previously, accurate quantification of the amount of food consumed is critical to this dietary collection method. Various amount estimation tools may be used to assess food intake and to help prime memory. Some examples are standard measuring cups and spoons, mug, glasses or bowls in various sizes, rulers, measuring grids, containers of beans or dry cereal for measuring handfuls, photographs or drawings, and three dimensional food models. Food amounts must then be converted to weights for nutrient calculations (Bauer & Sokolik, 2001).

The 24HR multipass method has been used to minimize memory recall bias. In a multipass interview, the interviewer will inquire and list only the names of the foods that the interviewee consumed; after the list has been created, the interviewer will go over each item probing about quantity eaten. Once quantities have been listed, he will then probe about the cooking/preparation method, time of consumption, and amount eaten, passing through the list of foods numerous time. At the end the interviewer will read all foods consumed to the interviewee to make sure no other foods are missing (Blanton, Moshfegh, Baer, & Kretsch, 2006).

The 24HR method has been validated against unobtrusive observation of what subjects eat, comparing observed with recalled intake. When foods are compared on an item by item basis, recalled items capture 70 to 80% of observed items (Emmons &

Hayes, 1973; Krantzler et al., 1982). In general, it has been found that recalls underestimate food intake by 10% in adults when compared to observed intake. In preschool children, where parental proxy is necessary, it has been observed that parents tend to overestimate their child's food intake using this same method (Ziegler et al., 2006).

Twenty-four hour recalls have been used as the gold standard in validation studies to which other dietary assessment methods can be compared. However, it is important to keep in mind that there are many limitations and potential sources of error attached to this assessment method. Due to the lack of a perfect standard in dietary intake validation studies, a method using an instrument considered to be superior is a common practice in this field (Willett, 1998).

This dissertation will employ a 24HR as the superior method to which we will compare a FFQ designed to measure what preschool children are eating.

The Food Frequency Questionnaire (FFQ)

Food frequency questionnaires measure the frequencies of intake of certain food items by the respondent. They consist of a list of food items usually divided into food groups. They may include a standard portion size or they may solicit the portion size consumed of a particular food item or group, depending on the detail to be assessed for the study of interest (Willett, 1998).

FFQs are based on an individual's perception of his or her usual intake over a defined period of time. Respondents report the frequency of consumption of each food item listed for a defined period of time. This time period may vary from 7 days to 1 year.

The analysis of the FFQ permits the estimate of nutrient intake based on frequency and reported or standard portion sizes of each food item from the list. In addition to the food list, a number of FFQs include summary food group questions, questions on restaurant eating, use of fat in cooking, and use of dietary supplements (Patterson, 2002).

The FFQ method is often used in dietary surveillance and in nutritional epidemiology studies. The advantages of using a FFQ method for assessing preschool intake are that it is a relatively inexpensive data collection method, it may reflect aspects of a more typical diet since frequency is estimated over a period of time, it may be used to screen high and low consumers of certain foods or nutrients, and its analysis is less time consuming than that of other dietary collection methods (Cade, Thompson, Burley, & Warm, 2001).

FFQs also present a series of limitations. For young children, parental or caregiver proxy is required. Parents or caregivers recall all foods consumed by the toddler for a particular time period, whether or not they have been with the child at all meals or times of food intake. In addition, a FFQ does not provide estimates of absolute intake or specific nutrient information and can be subject to numerous interpretations for the same food. For example, perhaps the parent recalls the child eating mixed vegetables (peas, corn, carrots, and lima beans). When answering the FFQ list for vegetables, they might answer that the child ate mixed vegetables or might check off each individual vegetable item: peas, corn, carrots, and lima beans; and/or forget a food item such as the lima beans or omit the butter that they added during preparation. The validity of a food frequency questionnaire in epidemiological studies can be evaluated against a 24HR, multiple

24HR, a food record, or against a biochemical biomarker from a representative subsample of the study population (Willett, 1998).

This dissertation validated a non-quantitative FFQ designed to capture certain food groups of preschool children's diets for a low income, low literacy, mainly Hispanic population of the state of Texas against a 24HR. The FFQ was designed to capture consumption of food items contained in the WIC food package, fruits and vegetables, iron-rich foods, sweetened beverages, and dessert items. The last two items were added to the FFQ to measure sugar consumption of toddlers.

The following table summarizes the strengths, limitations and uses of the two dietary methods previously described.

Table 1 *The 24-Hour Food Recall and the FFQ Comparison Chart (adapted from Ziegler et al., 2006).*

	24-hour recall	Food Frequency Questionnaire
Strengths	Relatively quick and easy to administer. No burden for respondent. Literacy not required (in person interview). Provides quantitative estimates of foods and nutrients for groups. Provides valid mean nutrient intakes for groups. Identifies foods that contribute to nutrient intakes and mean portion size of foods consumed. Provides detailed information on food preparation methods and food details for a single day of intake and meal patterns.	Easy to complete by subject. May be self-administered or read to subject. Does not require trained staff to administer. Inexpensive. Provides qualitative information on usual food intake. Gives an overall picture of the diet. Identifies foods usually consumed. Can be used to estimate nutrient intake if portion size and assumptions are made. May be used to rank a person's intake. Data can be easily processed

	24-hour recall	Food Frequency Questionnaire
	If more than one day of intake collected, it can provide usual nutrient intake.	and computerized.
Error	Coding of data may introduce additional error.	Incorrect selection of response category.
Uses	Has been used in national dietary studies.	Nutrition epidemiology studies; individual counseling and nutrition intervention studies.
Limitations	Requires trained staff to administer. May become costly if more than one administration is used. May not represent usual diet. Requires ability to judge portion size. Labor intensive method that requires coding of foods. Relies on memory. Data are limited to current diet. Affected by seasonality. Not valid for estimating usual	Associated with overestimation of consumption. Can not provide meal patterns. Provides little information or details on food preparation methods or specific foods (such as brand names). May be limited to certain food items or food groups. May be limited to a certain time period. May require ability to judge portion size when used.

	24-hour recall	Food Frequency Questionnaire
	nutrient intake of an individual. Not reliable for measuring daily intake of an individual. Tends to underestimate usual energy intake.	Requires literacy when self-administered. Difficult to estimate intake when foods are grouped in a list.
Limitations that pertain to population of interest	The use of a proxy can compromise accurate estimate of intake. Usually caregivers tend to overestimate actual consumption. May be difficult to complete if there is more than one caretaker. Affected by developmental stage.	Less standardized or tested for infants and young children. May be difficult to complete if there is more than one caretaker. The use of a proxy can overestimate the consumption of "good foods" such as fruits and vegetables.

USDA Food Behavior Checklist

Food checklists have also been used to collect dietary intake on some food groups or aspects of diet. In 1996, the University of California Cooperative Extension developed

and validated a Food Behavior Checklist (FBC) to assess the impact of nutrition education on the diet of participants of the Expanded Food and Nutrition Program and the Food Stamp Nutrition Education Program. The tool is unique in that it was created for use in a community setting and for low-income populations, is quick to administer, has low respondent burden, could serve as a teaching tool, is tailored to limited-literacy participants, and is appropriate for diverse audiences. The result was a 22-item food behavior checklist that was validated against serum carotenoid values and against three 24HRs. This checklist was shown to be valid, reliable, internally consistent and sensitive to any dietary changes, as well as easy to administer and inexpensive to score. The checklist targets food related behaviors and includes 22-items divided into five categories: fruit and vegetables (9 items), dairy (2 items), fat and cholesterol intake (5 items), diet quality (4 items) and food insecurity (2 items). It is unique because it not only captures food intake but it also looks at a variety of food related behaviors, which other food checklists fail to include. This instrument, however, was specifically designed to assess diets and food related behaviors of low income mothers (Townsend et al., 2003). The University of Texas Nutrition Education Team included some of the items in the development of the Feeding Your Toddler and Young Child Questionnaire.

THE FEEDING INFANTS AND TODDLERS STUDY

The nationwide Feeding Infants and Toddlers Study (FITS) showed that infants and toddlers participating in the Women's Infants and Children's Supplemental Nutrition Program (WIC) were less likely than non-WIC participants to have ever been breastfed (69% vs. 85%), or to be currently breastfed (21% vs 48%), and were more likely to

consume formula. The vast majority consumed formula (95% of 4 to 6 month old babies and 96% of 7 to 11 month olds) and 1/5 of the infants age 7 to 11 months consumed cow's milk, which is before the recommended age. WIC participants also tended to feed their children more total energy than the recommended estimated energy requirement (EER) for their age group. For infants 7 to 11 months actual energy intake exceeded the EER by 32%; for toddlers 12 to 24 months the EER was exceeded by 40% (Ponza et al., 2004).

The FITS study design was a cross-sectional telephone survey, that included a household interview, a 24HR of infants and toddlers as reported by their parents and a second-day 24HR for a random subsample of respondents. The analysis of the first 24HR showed that WIC participants consumed more 100% juice than non-WIC participants. A large number of WIC participants did not report consuming fruits and vegetables on the day of the recall (35% of older infants and 41% of toddlers). The most frequently reported vegetable consumed by toddlers was potatoes, which accounted for about 40% of the total vegetables reported. The consumption of fruit went down with age in WIC participants compared to non-WIC participants, from 47.8% vs. 39.2% at age 4 to 6 months, 64.7% vs. 81.0% at 7 to 11 months, and 58.5% vs. 74.6% at age 12 to 24 months. WIC participants 7 to 11 months reported a higher percentage of egg consumption (25% vs. 22%) and lower consumption of cheese (9.0% vs. 12.0%) and yogurt (5.5% vs. 13.3%). For toddlers aged 1 to 2 years, yogurt consumption was also lower among WIC participants, as compared to their non-WIC participants (9.3% vs. 18.9%). Sweets and desserts became increasingly popular as children got older (18.2% of the total sample at age 4 to 6 months vs. 64.3% at age 7 to 11 months, vs. 88.6% at 1 to 2

years). WIC infants 4 to 6 months consumed more sweets and desserts than non-WIC participants (18.2% vs. 6.7%), as did infants aged 7 to 11 months who participated in WIC (15.1% vs. 6.7%). WIC participating toddlers (47.4 vs. 35.3%) were more likely to consume sweetened beverages than other infants and toddlers (Ponza et al., 2004).

FEEDING YOUR TODDLER AND YOUNG CHILD SURVEY

The Nutrition Education Section of the Texas WIC program wanted to learn if these findings from the FIT survey were applicable to Texas WIC children and to see how they could tailor nutrition education efforts to better serve the needs of their WIC participants. One important aspect to consider was that the FIT studies did not include children older than 24 months. The epidemiological study designed to investigate the dietary quality of the WIC participant in the state of Texas would include children up to the age of 5.

The Feeding Your Toddler and Young Child Questionnaire was created by the University of Texas Nutrition Education (UTNE) team with input from the Department of State and Health Services WIC Nutrition Education staff (DSHS). The process of survey item development included item selection, item scaling, focus group interviews with WIC clients, and content validation. Much consideration was given to wording, response options and content validation for the survey items. Most of the items were selected from previously published research, which was reviewed by the Texas Association of Local WIC Directors, UTNE and DSHS staff and WIC clients who provided recommendations.

The end result was a 30 minute survey that included a non-quantitative method food frequency questionnaire designed for limited literacy, low income, mainly Hispanic parents of preschool children. This preschool food frequency questionnaire (FFQ) included a 65 item food list targeted to assess the frequency of consumption of specific foods from eight different food groups including dairy foods, fruits, vegetables, other WIC foods, sweets, sweetened beverages, baked goods and snacks. In addition to the FFQ, the survey incorporated items from the Food Behavior Checklist, allowing quantification of serving size consumption of certain foods such as milk, vegetables, fruits and juice.

The Feeding Your Toddler and Young Child Questionnaire explores twelve additional domains hypothesized to influence what and how preschool children eat. These domains included demographics, height and weight, selected food behaviors from the Food Behavior Checklist (Townsend et al., 2003), The Preschool Feeding Questionnaire (Baughcum et al., 2001), breastfeeding (WIC, 2005), food preparation (Willett, 1998), parental motivation (Alderson & Ogden, 1999), food security (WIC, 2004), self-efficacy to feed children fruit and vegetables, attitudes and nutrition knowledge (Harris, Loyo, Holahan, Suzuki, & Gottlieb, 2007; Roman-Shriver, Henderson, & Shriver, 2002). The survey was pilot tested in a convenience sample of local WIC agencies. The survey was administered in pen and pencil format and via telephone.

This dissertation examined the test-retest reliability of the Feeding Your Preschooler Questionnaire (this includes examining the test-retest reliability of the FFQ, parental perception of child preference, parental practices, parental role modeling and the self-efficacy scales to feed children fruits and vegetables). Secondly it focuses on the

construct validation of the FFQ part of the instrument using a 24HR. Lastly, it tested the nomological validity, a type of construct validity, of additional domains hypothesized to be related to what and how preschool children eat, including food insecurity, parental role modeling, child preference, accessibility and availability of fruits and vegetables at home, and parental practices related to fruit and vegetables and the child's actual fruit and vegetable consumption.

TEST-RETEST RELIABILITY

Test-retest reliability or "reproducibility refers to consistency of questionnaire measurements on more than one administration to the same person at different times, realizing that conditions are never identical on repeated administrations" (Willett, 1998; p. 101). Test-retest reliability studies usually use a repeated measures design, in which the participant answers the same survey at two different times. The two administrations are then correlated; the higher the correlations between the two administrations, the better the performance of the instrument (DeVellis, 2003). In conducting a test-retest reliability study, it is unrealistic to administer the instrument at a very short interval, such as a few hours, as subjects may simply tend to remember their responses to the first administration. In dietary studies, when a longer interval is used, true changes in dietary intake, as well as the variations in response contribute to reduced test-retest reliability. Test-retest reliability studies of FFQs have been examined under a wide variety of conditions and correlations have generally ranged from .50 to .70 for nutrient intakes and .40 to .60 for food groups (Willett, 1998).

Of the studies on test-retest reliability of FFQs in preschool children found, only two of these reported test-retest reliability of food group intake (Klohe et al., 2005; Metcalf et al., 2003). The other three measured nutrient intake (Basch, Shea, & Zybert, 1994; Huybrechts et al., 2006; Stein et al., 1992; Treiber et al., 1990). The timing between administrations of the two FFQs varied from 1 week to 1 year. These FFQ measured intake ranging from the past 3 months to 1 year. Average correlations obtained ranged from r=.38 (for the 1 year time frame between administrations) to r=.76 (for the 13 day time frame). In a similar population as the one in this dissertation, Klohe (2005) found significant correlations for 9 food categories (mean r=.69) with a range of .53 for soup to .84 for non-starchy vegetables. The authors used a different type of FFQ that addressed a 3 month food intake period and assessed its test-retest reliability in a 2 week time frame. The studies examining FFQs test-retest reliability are presented in Table 4.

The FFQ used in this dissertation was modified to assess intake in the past seven days. The seven day time period was deemed a more appropriate time frame for parents of preschool children because it is easier for them to remember what their child ate in the past week and questionable for them to remember the dietary intake of their child in the past three months, much less in the previous year. Therefore adapting the FFQ to measure a seven day period provides a more reliable and valid measure of the child's actual dietary intake. Eck and colleagues (1991) modified Willett's FFQ to assess diet in a seven-day period in adults. They used two test-retest reliability periods: within a few hours and the other done within seven days, obtaining correlations of r=.91 and .63 respectively. It has been argued that a short time frame between administration periods can overestimate and produce higher correlations, which could have been the case of the

correlation obtained by Eck and colleagues using the shorter time frame. This dissertation study used a two to four day time frame, in order to have overlap of the seven day sampling period and obtain more authentic measure of test-retest reliability of the FFQ instrument.

Table 2 *Test-retest Reliability Studies of FFQ in Preschool Children*

Author/ Year	*Population*	*FFQ Type*	*Test-retest Reliability*	*Time between administrations*	*Limitations*
Huybrechts et al., 2006	Location: Belgium Age: 2.5-6.5 yrs (n=60)	47-item Quantitative 1 year	Pearson's r= .80 Only calcium was reported.	5 Weeks	Measured only calcium.
Klohe et al., 2005	Location: South West US Age: 1-3 yrs Low-income Hispanic, African-American and	191-item Semi-quantitative Past 2 months	Spearman's average r=.69 Range: r=.53-0.84 Nine food categories.	2 weeks	Very small n.

Author/ Year	*Population*	*FFQ Type*	*Test-retest Reliability*	*Time between administrations*	*Limitations*
	White (n=25)				
Metcalf et al., 2003	Location: New Zealand Age: 1-14 yrs (n=130)	117-item Non-quantitative Past month	Spearman's average r=.76 Range: .50-.82 17 food categories.	13 days apart	Only reported reproducibility, however collected 24HR.
Basch et al., 1994	Location: New York Low-income Hispanic Age: 5.4 yrs (n=166)	Modified Willett FFQ Past six months.	Average for 3 month time frame r=.45 Range =-.06 - .5 Average for 1 yr r=.38 Range= .06 - .55 Calories and 11	3 months 1 year	Did not report number of items on FFQ.

Author/ Year	*Population*	*FFQ Type*	*Test-retest Reliability*	*Time between administrations*	*Limitations*
			nutrients.		
Treiber et al., 1990	Location: Multisite Middle socioeconomic class Age: 3-5 yrs. (n=55)	111-item modified Willett FFQ Time frame: Past 3 months.	Pearson's average r=.67 Range: r=.42-.83 Eleven nutrients.	1 week	Participants were of middle socioeconomic class background.

VALIDATION

Validity has been defined as "the extent to which a measuring instrument measures what it intended to measure" (Carmines & Zeller, 1979; Krathwohl,1998). Validity is an important characteristic of an evaluation measure and is an estimate of the accuracy of the instrument (Contento, Randell, & Basch, 2002). Validity is inferred from how the scale was constructed, how able it is to predict specific events and its relationship to measures of other constructs. Using this interpretation of validity we can describe three main types of validity, including content, criterion and construct validity, with each type differing in the way it approaches assessing the extent in which a tool measures what it was designed to measure (Carmines & Zeller, 1979; DeVellis, 2003).

Content validity concerns the extent to which a specific set of items reflects the content of the subject matter or domain that it intended to cover (Krathwohl, 1998). In other words, it concerns the sampling adequacy of the items to a specific domain, which is easy to evaluate if the domain is well defined (e.g., all numbers taught in kindergarten). When designing a scale to measure attributes, such as self-efficacy beliefs, where there is no well defined universe, expert review can be used to measure the relevance of items to that of the domain of interest and to maximize item appropriateness (DeVellis, 2003). Content validity has already been established for the Feeding your Toddler and Young Child Survey through extensive expert review and focus groups.

Criterion-related validity refers to an empirical association between the item or scale with some criterion or "gold standard" (DeVellis, 2003). There are three types of criterion-related validity described by the time relationship between the measure being

tested and the criterion. These are predictive (precedes), concurrent (coincides) and post-predictive (follows) validity. The most important aspect of criterion-related validity is the strength of the empirical relationship between the two events (DeVellis, 2003; Krathwohl, 1998). Criterion validity will not be assessed in this study, because it is not appropriate for dietary intake measures as there is no gold standard and all methods present some type of error (Willett, 1998). Since the 24HR is considered a superior method to the FFQ, it is possible to assess construct validity.

Construct Validity

The purpose of construct validity is to show that a measure is a valid measure of a construct (Krathwohl, 1998). A construct is a characteristic that exists that cannot be directly measured; it is, therefore, inferred from other indirect measures designed to assess it. Construct validity combines theoretical and empirical sources. There are many types of construct validity. This dissertation employed convergent and nomological validation.

Convergent validity measures the degree to which a test or operation is similar to another operation that theoretically should also be similar (Townsend et al., 2003). This dissertation will determine the convergent validity of the FFQ portion of the Feeding your Toddler and Young Child Survey against a 24HR. 24HR is considered a superior method to the FFQ. In other words, how well does food intake as measured by the FFQ correlate with food intake measured by the 24HR. 24HRs in pediatric populations have been validated against unobtrusive observation (Baranowski, Sprague, Baranowski, & Harrison, 1991; Basch et al., 1990; Eck, Klesges, & Hanson, 1989; Stein, Shea, Basch,

Contento, & Zybert, 1991), biochemical markers (Shea et al., 1991), and double labeled water (Johnson, Driscoll, & Goran, 1996). To show construct validity, the scores on the FFQ should be correlated with scores on 24HR. High correlations between the two methods of assessing dietary intake would be evidence of a convergent validity (DeVellis, 2003).

When conducting a validation study, one must not only consider the comparison standard against which to validate the new instrument but also take into consideration the choice of an appropriate time frame, the sequence of data collection, and the number of subjects for the validation study. The FFQ was designed to establish frequency of intake in the past 7 days. Most FFQ for adults use longer time periods, usually from the previous 3 months to 1 or more years. The objective of these FFQs is to obtain an estimate of "true" intake, which is usually the average intake over a long period of time for most adults. Compared to adults, preschool children have a more limited variety in their diets and tend to repeat patterns of food intake, so a shorter time frame is appropriate. In a convergent validation study, the time frame of the FFQ and the comparison method must be similar (Cade et al., 2001; Serdula, Alexander, Scanlon, & Bowman, 2001; Willett, 1998). Thus, while the long time frame for an adult FFQ would require 3 - 4 recalls across the time period, the 7 day period for the preschooler FFQ is appropriately compared to a single 24HR. Willet (1998) notes that even a single day of diet recall data can be used for calibration or measurement error correction purposes (Willett, 1998). On the other hand, Eck and colleagues (1991) validated a one-week food frequency questionnaire (7DFFQ) against three 24HRs, obtaining high correlations between the mean of the three recalls and their seven day FFQ. Hoelscher and colleagues (2003)

validated the food choice behavior section of the school based nutrition monitoring questionnaire similar to a FFQ against a single 24HR obtaining adequate range of correlations for food from .32 for breads and .68 for milk and beans. Resnicow and colleagues compared correlations obtained from a single 24HR, an FFQ and an average of three 24HR against serum carotenoid level in an adult minority population and found similar correlations amongst the three methods (r=.37, r=.35 and r=.42 respectively) (Resnicow et al., 2000). Based on these studies, this dissertation proposed to validate the FFQ against a single 24HR with the recall in the FFQ time frame.

The sequence of data collection for validation studies is also of concern, because one measure could have an impact on how the other one is answered. This is important when subjects complete daily dietary records and have become sensitized to their food intake and therefore artificially improve the correlations, because their accuracy in completing the subsequent instrument is increased. On the other hand, administering the questionnaire before the detailed assessment would artificially lower the correlation, as the questionnaire would relate to the diet before the time period in question (Willett, 1998). In this study, the 24HR was administered before the FFQ. In this case, the more detailed method would be the 24HR, since that day's intake will coincide with one of the days on the FFQ. A falsely high correlation is unlikely, however, since parents were not sensitized to record their child's intake prior to the administration of the 24HR interview.

Seven studies have validated FFQ in preschool children using a 24HR as a validation standard (Blum et al., 1999; Huybrechts, De Bacquera, Matthysa, De Backera, & De Henauwa, 2006; Klohe et al., 2005; Parrish, Marshall, Krebs, Rewers, & Norris, 2003; Stein, Shea, Basch, Contento, & Zyberf, 1992; Stein, Shea, Basch, Contento, &

Zybert, 1994; Treiber et al., 1990). Table 2 displays demographic characteristics of the participants, sample size, type of FFQ, comparison method used, test sequence, correlation coefficients obtained, and cross-classification analysis results for each study.

Table 3 *Validation Studies of FFQ Using 24HR as the Comparison Method in Preschool Children*

Author/ Year	*Population*	*FFQ Type*	*Comparison method*	*Test sequence*	*Validity correlations*	*Limitations*
Huybrechts et al., 2006	Location: Belgium Age: 2.5-6.5 yrs (n=509)	47-item Quantitative Time frame: Past year.	Estimated dietary record similar to three 24HR vs. one FFQ.	FFQ administered first. 3-day record administered 1 week after the FFQ.	Pearson's r=.52 calcium only. 83% of subjects correctly classified in same or with in a category.	Only measured calcium.
Klohe et al., 2005	Location: South West US. Low-income Hispanic, African-American and	191-item Semi-quantitative Time frame: Past two months.	Average of one 24HR with 2-day food records vs. one FFQ.	Not specified.	Spearman average r=.41 Range: r=.10-.69 Food groups. 78% of subjects correctly classified in same or with in a quartile.	Mothers were overweight or obese and part of an intervention study. FFQ was reduced to 107-items for analysis.

Author/ Year	*Population*	*FFQ Type*	*Comparison method*	*Test sequence*	*Validity correlations*	*Limitations*
	White children Age: 1-3 yrs (n=52)					
Parrish et al., 2003	Location: Denver, CO. Non-Hispanic (79%) Age: 1-3 yrs (n=68)	111-item Willett FFQ Time frame: Past year.	Average of three or four 24HR vs. one FFQ. Nutrient biomarkers for 38 children vs. one FFQ.	24HR were administered every 3 months. FFQ was administered at the end of the year, after the recalls.	Pearson's average r= .37 Range: r=.08- .42 Five nutrients and total energy intake. Spearman's average for biological measures r= .26 Range: r=0-.51.	Part of the Diabetes Autoimmunity Study in the Young (DAISY), these children are known to be at risk for Type I diabetes.

Author/ Year	*Population*	*FFQ Type*	*Comparison method*	*Test sequence*	*Validity correlations*	*Limitations*
Blum et al., 1999	Location: North Dakota Low income Multicultural Native American and Caucasian children Age: 1 to 5 yrs (n=233)	84-item Harvard Service FFQ a semi-quantitative FFQ Time frame: Past four weeks	Average of three 24 HR vs. average of two FFQ.	24HR were collected over the four weeks following the first FFQ. (FFQ, three 24HR, FFQ)	Pearson's average r=.52 Range: r=.26-.63 20 nutrients.	Used an average of the two FFQ to compare to the average of the three 24HR. The first FFQ did not include the same period of data included in the 24HRs.
Stein et al., 1994	Location: New York Low-income Hispanic	109-item modified Willett semi-	Average of seven 24HR and six FFQ.	Analyzed data for years 1 and 3. Used average of three 24HR to	Pearson's average r= .28, .27 for year 1 and 3 respectively. Range: r= .01-.61, .06-.41	Obtaining two cross-sectional estimates increases error, resulting in attenuation of the

Author/ Year	*Population*	*FFQ Type*	*Comparison method*	*Test sequence*	*Validity correlations*	*Limitations*
	Age: 3-5 yrs (n=173)	quantitative FFQ Time frame: Past 6 months		compare to the average of two FFQ.	year 1 and 3 respectively. Nine nutrients. No consistent classification into quartiles.	measure of association between the two methods.
Stein et al., 1992	Location: New York Low-income Hispanic Age: 3-5 yrs (n=238)	109-item Modified Willett semi-quantitative FFQ Time frame:	Average of four 24HR vs. average of two of three FFQ.	Used two of three FFQ administered 6 months apart. Administered 24HR first then the FFQ except during the first	Pearson's average r=.34 Range: r= .05 to .78 Nine nutrients and total energy. 48.9-68.9% correctly classified into the highest two quintiles.	Used an FFQ designed for adults in children with only minor modifications. Found that FFQ overestimated intake in this population.

Author/ Year	*Population*	*FFQ Type*	*Comparison method*	*Test sequence*	*Validity correlations*	*Limitations*
		Past 6 months.		administration both on the same day. First FFQ not used in analysis.		
Treiber et al., 1990	Location: Multisite Middle socioeconomic Age: 3-5 yrs. (n=55)	111-item modified Willett FFQ Time frame: Past 3 months.	Average of two 24HR vs. an FFQ at time 2.	24HR administered first then FFQ. This was done twice with a week between administrations.	Pearson's r= .48 Range: r=.40-.62 Only four nutrients reported.	Only reported 4 out of 11 possible nutrient correlations.

The sample population among these studies was diverse. Three used mainly low-income, Hispanic participants (Klohe et al., 2005; Stein et al., 1994; Stein et al., 1992); only one represented the southern United States (Klohe et al., 2005); the other four ranged in ethnicity, income and location (Huybrechts et al., 2006; Parrish et al., 2003; Blum et al., 1999; Treiber et al., 1990). The types of FFQ used in these studies were modifications of the Willett and Harvard Service FFQs, which are validated for use in adult populations. These modifications included replacing food items that were not eaten by the study participants with other foods commonly eaten according to their ethnicity and age group (Stein et al., 1992; Stein et al., 1994; Klohe et al., 2005) and portion sizes were changed to reflect children's serving sizes (Stein et al., 1992; Stein et al., 1994; Klohe et al., 2005; Blum et al., 1999). Another common modification was to reduce the referent time frame to reflect intake during the previous month (Blum et al. 1999), previous two months (Klohe et al., 2005), three months (Treiber et al., 1990) or 6 months (Stein et al., 1992) rather than the past year, except for the studies by Parrish and colleagues (2003) and Huybrechts and colleagues (2006); these modifications were done mainly to help decrease memory retrieval errors. The study by Huybrechts and colleagues (2006) was different from the other six studies in that it focused on calcium intake during the past year. In addition to the food group categories found in the other seven studies, it contained an additional list of calcium rich foods and required a detailed estimation of calcium intake. This FFQ used three to four daily portion size categories per food item and a list of common standard measures as examples for estimation of intake (Huybrechts et al., 2006).

Only Klohe and colleagues (2005) validated their FFQ at the food group level. The other six studies validated at the nutrient level. The study by Klohe and colleagues used a semi-quatitative FFQ in a triethnic population which included only 25 Hispanic preschool children. This study was conducted in overweight low income mothers participating in a weight loss intervention program and used a slightly different age group (1 to 3 year olds) and a different validation standard then the one proposed by this dissertation.

The comparison method used to validate the FFQ in these studies was the 24HR. All of these studies used multiple 24HR to reflect the same dietary intake period as their FFQ. Three to four 24HR administrations has been deemed appropriate for use to compare to a FFQ that inquired about the previous 3 to 12 month periods (Stein et al., 1994; Stein et al., 1992; Treiber et al., 1990; Huybrechts et al., 2006; Parrish, et al., 2003; Willet et al., 1998)

This dissertation proposed validating a modified version of the Willett and Harvard Food Service FFQs. This version was created for low literacy participants of the Texas WIC program. Modifications included addition of foods eaten by Hispanics. Portion sizes were not included and the referent time frame was reduced from the previous year to the previous week, in order to capture a less biased representation of dietary consumption due to parental memory recall issues. Eck and colleagues have validated the use of a FFQ that measures dietary intake in the past week in adults (Eck, Hanson, Slawson, Lavasque, & Klesge, 1991). To my knowledge, a seven day FFQ has not been tested or validated among pediatric populations.

The multipass 24HR was selected as the validation comparison method for this dissertation study. The study methodology employed by Hoelscher and colleagues (2003) was used. They validated a food choice behavior questionnaire similar to the FFQ against a single administration of the 24HR in 3rd grade children. Resnicow and colleagues have also compared correlations obtained from a single 24HR, a FFQ and an average of three 24HR against serum carotenoid levels in an adult minority population and found similar correlations amongst the three methods (r=.37, r=.35 and r=.42 respectively) (Resnicow et al., 2000). Therefore this study employed a single multipass 24HR as a comparison validation standard. Table 3 depicts the findings from these three studies.

Table 4 *Other Validation Studies*

Author/ Year	*Population*	*FFQ type*	*Comparison method*	*Test sequence*	*Validity correlations*	*Limitations*
Hoelscher et al., 2003	Location: Texas Age: Eighth grade students (n=254)	Food choice behavior items similar to an FFQ Time frame: Past week.	Food choice behavior items vs. 24HR.	Half received the 24HR before the food choice behavior items.	Spearman's r=.53 Range: r=.32-.68 17 food categories. Percentage agreement ranged from 38% to 89%.	Did not use a FFQ. Measured in older children.
Resnicow et al., 2000	Location: Atlanta African-American Age: 18-87yrs (n=414)	36-item FFQ Time frame: Past week.	One 24HR or three 24HR, serum carotenoid level vs. FFQ.	Sequence of the FFQ and 24HR varied across participants. Serum carotenoid levels	Pearson's r=.35, .37, .42 for FFQ, single 24HR and average of three 24HR vs. serum carotenoid levels. 7 nutrients. Range: r=.21-.40; .19-.39;	African-American Adults.

Author/ Year	*Population*	*FFQ type*	*Comparison method*	*Test sequence*	*Validity correlations*	*Limitations*
				administered 10-12 days after the FFQ or last 24HR.	.18-.48 for FFQ, single 24HR and average of three 24HR compared to serum carotenoid levels.	
Eck et al., 1991	Location: Memphis, TN Age: 17-47 yrs (n=41)	120-item Willett FFQ Time frame: Last week.	Average of three 24HR versus one FFQ.	24HR administered on Sunday, Tuesday and Thursday. FFQ administered at the end of the third session.	Pearson's average r= .74 Range: r=.43- .88 12 nutrients. 93%-54% of subjects were correctly classified into quartiles.	Convenience sample of college students.

Nomological Validity

Nomological validity is a type of construct validity. The purpose of nomological validity is to demonstrate whether the measure relates to measures of other constructs in a way that makes sense logically according to a theory in which the constructs you are validating are embedded. A nomological network is an interlocking system of laws that constitutes a theory. These laws may "relate to (a) observable properties or quantities to each other, (b) theoretical constructs to observables or (c) different theoretical constructs to one another" (Cronbach & Meehl, 1955). The idea is that theories have networks of constructs that relate to each other. For this study, Social Cognitive Theory predicts that determinants related to fruits and vegetables such as parental self-efficacy, parental perception of child preference, parental role modeling of consumption, and parental practices and home accessibility and availability form part of a network and that this network is related to the child's consumption of fruit and vegetables. These constructs being in some way correlated to fruit and vegetable intake would provide evidence of nomological validity.

CHILDHOOD OBESITY

Children are fatter today than they were 20 years ago (Ogden et al., 2002). The preschool child is no exception. The National Pediatric Nutrition Surveillance System report for 2006 observed that the percentage of overweight and at risk for overweight children aged 2-5 had increased to 30.2%, a steady increase from that observed in the previous years (Ziegler, Briefel, Clusen, & Devaney, 2006). Hispanic children, who represented 72.4% of the sample, were found to be at greater risk for both obesity and overweight than the national average (35.8% vs. 30.2%). Hispanics are the fastest growing minority in the state of Texas (36% of the Texas population), making this health disparity especially important. The report found that Texas

children aged 2-5 were above the national average in the obese category (16.7% vs. 13.8%), while just below the national average (15.3% vs. 16.4%) in the overweight category (Ziegler et al., 2006).

Data from the NHANES surveys (1976-1980 and 2003-2004) also demonstrated an increase in pediatric overweight for children 2 to 5 years old. During this period, the prevalence increased from 5.0% in 1976-80 to 13.9% in 2003-04. The Texas Women's Infants and Children's Supplemental Nutrition (WIC) program reported the prevalence of obesity in low-income toddlers aged 2 to 5 to be 21.3% with rates higher among Hispanic participants (22.7%) than among African American (15.9%) and Caucasian (16.3%) participants (DSHS, 2008).

As obesity continues to be a public health concern of this century, it is natural for researchers to attempt to understand the causes and determinants of overweight among preschool children. It is rather simplistic to suggest that overweight is simply determined by caloric balance, calories in equal calories out. This equation, as simple as it may seem to some, has many psychosocial and environmental determinants attached to it that may steer the equation into positive caloric balance and create, over time, an overweight child.

THEORETICAL FRAMEWORK- SOCIAL COGNITIVE THEORY

Social Cognitive Theory (SCT) is a model of interpersonal health behavior (Glanz et al., 2002) that emphasizes the role of the physical and social aspects of the environment. According to Bandura (1986), behavioral, environmental and personal factors all interact in a dynamic and triadic reciprocity model termed reciprocal determinism. The theory also involves acquisition of skills, competency management and cognitive behavioral control despite adverse conditions. It focuses on enhancing a person's knowledge, skills and self-confidence. Health behavior may be explained and predicted by several key concepts such as self-efficacy, observational learning, outcome expectations, skills, and reinforcements (Glanz et al., 2002).

SCT provides a framework to understand the psychosocial dynamics that influence human behavior. The theory has been used as a framework for understanding and modifying dietary behavior in adults and older children (Davies et al., 2005; Domel et al., 1996; Neumark-Sztainer et al., 2003; Resnicow, Davis-Hearn, Smith, Baranowski, Lin, & Baranowski, 1997). For example, Newmark-Sztainer and colleagues (2003) studied the correlates of fruit and vegetable intake, including personal, behavioral and social environmental factors, among adolescents in Minnesota. They found the strongest correlates for fruit and vegetable intake to be home availability and taste preference. They concluded that interventions to increase fruit and vegetable intake in adolescents should target home availability of fruits and vegetables.

This study will use SCT as a framework to understand the relationships among the child's fruit and vegetable consumption (behavior), fruit and vegetable access and availability in the home (physical environment), parental role modeling, parental practices regarding fruit and vegetables, and parental self-efficacy beliefs surrounding preparation, buying and serving of fruits and vegetables (social environment), and parental perceptions of child preference (as a personal factor).

Figure 1 introduced in chapter 1, page 11, uses SCT to describe the relationship between the child, child's behavior (fruit and vegetable intake) and his environment. This model of preschool child feeding acknowledges the importance of the parent's role in affecting the physical and the social environment.

Behavior

Behavior is an observable act. In this study it is defined as the fruit and vegetable intake of the preschool child as reported by their parent or caregiver. The performance of any behavior is determined by the expected outcomes of behavior and the expectations formed by either one's own direct experience or that experience mediated by vicarious reinforcement (Pajares, 2002).

Fruit and Vegetables Consumption

In light of the obesity epidemic, fruit and vegetable consumption has received special attention for interventions for obesity prevention, mainly because fruit and vegetables are lower in calories, nutrient dense, higher in fiber, and beneficial to health as compared to other foods. Fruit and vegetable consumption has been associated with reduced cardiovascular morbidity and mortality (Dauchet, Amouyel, Hercberg, & Dallongeville, 2006), reduced risk of cancers such as lung, colon and bladder cancers (Riboli & Norat, 2003; Williams, Wareham, Cox, Byrne, Hales, & Day, 1999), better insulin sensitivity (Williams et al., 1999), and greater bone mineral density (New, Robins, Campbell, Martin, Garton, & Bolton-Smith, 2000).

In addition to the numerous health benefits acquired by the consumption of fruit and vegetables, research has found that diets high in fruits, vegetables, grains and fiber may displace fat intake and aid in weight control and weight loss efforts (Rolls, Ello-Martin, & Carlton-Tohill, 2004). In preschool children, the research in this area is limited, despite the numerous health benefits associated with consumption of these foods (Baranowski et al., 2000).

The amount of fruit and vegetables recommended by the United States Department of Agriculture (USDA) and United States Department of Health and Human Services in its food guide pyramid is based on the estimated energy requirement (EER) for an individual. The EER is calculated using gender, age-specific and estimated energy expenditure equations. For children aged 2 to 6, the EER ranges from 1000 to 1800 Kcal; the estimated fruit and vegetable consumption ranges from 2 to 4 cups of fruits and vegetables (1 - 1.5 cups of fruit and 1 - 2.5 cups of vegetables) or, depending on the child's age, 3 - 8 servings of fruits and vegetables (Note: for a child aged 2 - 4, a serving equals 1/3 cup; for a child aged 4 - 8, a serving size is equal to ½ cup of fruit and vegetables) (ADA, 2008; USDA, 2005b). Despite these recommendations, research suggests that preschool children do not consume enough fruits and

vegetables. Dennison and colleagues (1998) found that 40% of 2-year-old children and 50% of 5-year-old children consumed less than 2 servings/day of fruits and vegetables. They also reported that preschool children ate more fruit than vegetables. In their study, 85% of the children met the recommendation for fruit while only 25% met the recommendation for vegetables. Fruit juice accounted for 54% of all fruit servings consumed. This same group reported that children who drank in excess of 12 ounces of juice a day were more prone to overweight and low stature (Dennison, Rockwell, & Baker, 1998). In the Feeding Infants and Toddlers Study (2004), parents reported that, on a given day, 25% to 30% of infants and toddlers aged 9 to 24 months consumed no fruit and 20% to 25% consumed no vegetables. Of those who consumed vegetables, 25% ate them as French fries (Briefel, Reidy, Karwe, Jankowski, & Hendricks, 2004). In another study of fruit and vegetable intake of 5 year old girls, the mean intake reported was 3.1 ± 1.6 servings/day. Our Texas study, using the Feeding Your Toddler and Young Child Questionnaire, found that fewer than half (48.5%) of the children aged 1-5 years of age for whom data were reported ate 5 or more servings of fruit and vegetables a day (Unpublished, 2008).

Personal factors

The Preschool Child

In order to understand the preschool children's feeding behavior, we must also understand their growth patterns. Growth patterns and food intakes in preschool children are varied and are not linear and constant. During the preschool years the actual increments of change are small compared to the increments seen in infancy and adolescence. After the first year of life, growth rate slows down considerably, in contrast to the tripling of birth weight and doubling in length observed during the first 12 months (Macnair, 2004). Thereafter weight will

increase an average of 4.5- 6.5 pounds per year and height increments average about 2.5 to 3.5 inches per year from age two until puberty. Appetite tends to follow growth rate; therefore an infant who has "good" appetite and eats all of the food given to him will most likely have "fair to poor" appetite in the following years and eat what seems to be a lesser amount per ounce of body weight compared to what he ate in the first year (Mahan & Escott-Stump, 2004).

For the most part, the growth process in the preschool child is steady and slow, although most children will go through "holding patterns" where growth will remain stagnant for several months and then their growth will increase erratically. These growth "spurts" are accompanied by obvious changes in appetite and food intake. For parents who are not knowledgeable about these growth trends, slow growth and poor appetite usually causes anxiety, which may lead to mealtime struggles (Mahan & Escott-Stump, 2004).

In addition, preschool children's appetites will be influenced by more than their physical growth trends. The child will also be growing in other domains, such as the cognitive, emotional and social areas, and these changes will influence their food intake. In infancy, the child is introduced to spoon-feeding and solids and is weaned from the bottle or breastfeeding. Food not only functions to satisfy hunger, but is also a means to explore the environment and practice fine motor skills. After age two, the child becomes familiar with eating, and eating becomes secondary to social, language and cognitive growth, with the child becoming more interested in his or her surroundings (Samour, Helm, & Lang, 1999). This lack of interest in food challenges the feeding interaction between the child and the caregiver.

In addition, family and cultural factors related to eating play a significant role in parental beliefs of how the preschool child should be fed and how they should physically appear in order to resemble health. In the Hispanic culture, for example, beliefs are such that a healthy preschool child "should" be on the heavy side. In fact a "chubby" child is considered a healthy child

(Baughcum, Burklow, Deeks, Powers, & Whitaker, 1998; González & Alcañiz, 2006). Good parenting skills are reflected in the nourishment of their children. Therefore a mother or caretaker of a child who presents an average weight for height or a normal body mass index or who requires fewer calories for growth may struggle balancing her cultural beliefs with the everyday tasks of feeding her child.

Preschool Children's Food Intake

The importance of nutrition in child growth and development is well recognized. Research continues to suggest that nutritional status in infancy and childhood may be linked to health status in the adult years (Baker, 1990; Jebb & Moore, 1999). National surveys of children's nutrition include the National Health and Nutrition Examination Survey (NHANES) and the Continuing Survey of Food Intakes by Individuals (CSFII).

The most recent data provided in NHANES provide evidence of excessive nutrient consumption by this generation of 2 to 5 year-olds. The mean energy intake for this group was 1719 Kcal; 59.2 g (13.9%) protein, 236 g (55.1%) carbohydrate, 62 g (32.2%) fat, 23.1g (12%) saturated fat, 10.8 g fiber. It is interesting to observe that children are eating 100 Kcal more per day than the recommended amount suggested by the USDA. These obesity-promoting diets can create an extra 10 pounds of weight over a year's time (NHANES, 2003-2004).

The "Feeding Infants and Toddler Study" (FITS) supported by the Gerber Products Company also provides evidence of what it is that preschool children are eating. Fox and colleagues (2004) reported on the most common foods eaten by children aged 7 to 24 months. They found that 85% or more of toddlers 12 months and older were drinking cow's milk at least once a day and that most of the milk fed to toddlers was whole milk (74.5%), with about 14% of these children drinking flavored milk. Non-infant cereals were among the grain products most commonly consumed by children 12-24 months, with about 18-26% (depending on the age

group) consuming presweetened varieties. Parent respondents reported that 18 to 23% of the preschoolers between 12-24 months consumed no vegetables as separate items and that 25-33% did not consume fruits as a single item on the 24-hour recall interview. The fruit and vegetables reported in this age group had low nutrient density and were higher in calories. French fries were the most common vegetable consumed by 19-24 month olds, with 25.5% eating French fries at least once in a day. By 19-24 months 90.5% of all infants consumed dessert at least once a day. Desserts were defined as any type of sweets, including cookies, candy, sugar, syrup, sweetened beverages, carbonated beverages and fruit flavored drinks (Fox, Pac, Devaney, & Jankowski, 2004).

The authors of the FITS studies point out several areas of concern. The use of low-fat milk in this age group contributes to fat restriction in diets of young children (AAP, 1998), and such restrictions can lead to inadequate consumption of food energy and essential nutrients, such as fat soluble vitamins (A and D especially) and essential fatty acids (AAP, 1998; Picciano et al., 2000). The consumption of presweetened cereals can contribute to the preference of sweetened food later in life. Although many of these cereals are fortified with vitamins and minerals in amounts comparable to unsweetened varieties, they fall short in iron in comparison to fortified infant cereals that have been recommended by CDC as a strategy to prevent iron deficiency anemia in toddlers. The low vegetable and fruit consumption is a major concern, as daily consumption of these two food groups are the foundation of a healthy diet. The FITS study also pointed out that toddlers' eating patterns are a reflection of those of their families. Many of the patterns observed by the FITS study have been observed in older children and the US population (Fox et al., 2004). It is alarming that these patterns are forming at extremely young ages (9 to 11 months), especially in light of the increasing childhood obesity epidemic.

Child Food Preferences

Throughout the preschool years, children begin a process in which they will classify foods as "like" and "don't like." Foods begin to be identified as "good for you," but the reasons are sometimes not comprehended, mistaken or simply unknown to the child (Mahan & Escott-Stump, 2004). It is common during these years to find that children may develop certain food related behaviors that are associated with developmental issues such as independence (Kuczynski & Kochanska, 1990) .

Preschool children may experience neophobia, an unwillingness to try new foods, go through food "fads" or engage in repetitious diet patterns. Children with restrictive diet patterns, that offer less variety will likely have less nutrient intake compared to children without neophobia or repetitious diets (Falciglia, Couch, Gribble, Pabst, & Frank, 2000). Falciglia and colleagues classified 70 children using the food neophobia scale into three groups: neophobic, neophilic and normal. Each child's parent filled out a three day diet record. Diets were analyzed for energy intake, macro- and micronutrient intake, and number of servings according to the Food Guide Pyramid groups and scored on the USDA Health Eating Index. Children classified with neophobia had higher intakes of saturated fat and less food variety in their diets compared to the other two groups. These neophobic children's diets met most of the RDA/DRI except for vitamin E, folate, calcium, zinc and fiber. The adequacy of the diets were probably a result of the higher consumption of fortified foods such as cereals rather than from consuming food naturally dense in nutrients. Insufficient nutrition during these critical growth and developmental periods can place a child at risk for impaired nutrition and adverse health outcomes, such as failure to thrive and arteriosclerosis, the latter associated with higher saturated fat intake.

In addition to neophobia, toddlers may also exhibit repetitive food behaviors, conditions described as "food fads" and "picky eating". These two encompass periods of food restriction

and limited variety of the child's diet, which in turn could limit the nutrient quality, and over time, result in a nutrition deficiency (Carruth & Skinner, 2000). It has been postulated that these food behaviors will change over time as a result of maturity. However, unless the environment and parental influence are such that the fad and picky eating are dealt with in an effective way such as not tailoring the child's diet to the food fad or to the child's requests, under-nutrition is common. Carruth and Skinner (2000) followed children at 42 through 84 months of age. Over time, maturity did not improve the child's neophobic behaviors. In this study parents reported offering the unfamiliar food fewer than three times before deciding the food was disliked. In a Swedish study of 57 families, researchers reported an association between neophobic behavior in children and the mother's serving fewer foods in the last six months from a list of novel or unfamiliar foods (Koivisto & Sjödén, 1996).

Numerous research studies continue to suggest that as a toddler is exposed to unfamiliar foods multiple times his food acceptance is increased to that particular food. Birch and colleagues (1987) found that preschoolers aged 3 to 5 years needed at least 10 to 15 exposures to gain acceptance of a new food. However, parents of preschool children who do not give their children sufficient opportunities and consistent exposures to unfamiliar foods over time ultimately limit variety in their children's diet (Carruth & Skinner, 2000).

Personal factors, such as food preferences, are thought to be the strongest determinants of eating behavior (Birch & Sullivan, 1991; Contento, 1991; Neumark-Sztainer, Wall, Perry & Story, 2003). Research has demonstrated that food preference is an effective predictor of fruit and vegetable consumption (Domel et al., 1996; Neumark-Sztainer et al., 2003; Resnicow et al., 1997). In one group, Domel and colleagues found significant correlations between fruit and vegetable intake and self-efficacy beliefs, outcome expectations, and fruit and vegetable preference in a sample of 4th and 5th grade students. However, in their multivariate analysis, only

fruit and vegetable preference remained a significant predictor of consumption (Domel et al., 1996). In another study of third graders that used a SCT framework, bivariate correlations between the SCT variables and fruit and vegetable consumption ranged from .17 for asking skills to .29 for fruit and vegetable preference. After controlling for school level, only preference and positive outcome expectations remained significantly associated with fruit and vegetable consumption. Preference and positive outcome expectations accounted for 10-11% of the variance (Resnicow et al., 1997). In project EAT (Eating Among Teens), a large population-based study in Minnesota, taste preference and availability were found to be the strongest correlates of fruit and vegetable consumption (Neumark-Sztainer et al., 2003).

If the strongest predictor of food intake in children and adolescents is food preference, then in order to modify food intake it is important to understand the determinants of food preference. Food acceptance patterns appear to be developed early in life (Birch & Fisher, 1998). The development of food preference has been explained in part by Rozin's (Rozin, 1980) concept of food neophobia and food exposure suggesting that repeated exposure can overcome dislike of foods (Birch & Marlin, 1982). Since food exposure plays such a critical role in the development of food preference patterns and since food exposure is in the hands of the parent or caregiver, it is important to study the child's daily social and physical environments. Skinner and colleagues (2002) performed a longitudinal study on child preference and found that the strongest predictor of food preference at 8 years (R^2=.74) was what the child liked at age four ($p<.001$) and their food neophobia score as preschoolers ($p<.001$). Newly tasted foods were more likely to be accepted at ages 2 to 3 years than at 4 or 8 years. They found a moderately significant relationship between what mothers ate and what their children ate. In other words, the earlier and more often a caregiver offers new foods, the greater the likelihood a child will have a

varied diet. Not surprising they also reported that foods disliked by mothers tended not to be offered to children.

This dissertation used child preference for fruit and vegetables as described by their parent or caregiver as a factor attributed to the person (child) in this model.

Environment

The environment is defined as those factors physically external to the individual and consists of both the social and physical environments. Each of these can provide the stimuli needed to reinforce either a desired or undesired behavior. The social environment includes family, friends and peers (Glanz et al., 2002). When studying the preschool child, the interpersonal interaction between the child and the caregiver is extremely important. The caregiver is a role model; therefore, the eating practices in which they engage are critical to the promotion of the healthful eating behavior. They are also in charge of certain aspects of the physical environment, such as accessibility and availability of the food in the home. The environment plays an important role in eating behavior, including fruit and vegetable intake (Domel et al., 1996; Hearn et al., 1998; Kratt et al., 2000).

Social Environment

The social environment includes parental self-efficacy, parental practices and parental role modeling.

Self-efficacy, a type of self-confidence, is defined as the belief a person has about how capable they are in performing a particular behavior given his or her particular situation (Bandura, 1997). Self-efficacy mediates the relationship between knowledge and behavior. For example, a mother may have the knowledge needed to feed her child nutritious foods such as

fruits and vegetables, but may be unable to do so because of low self-efficacy (e.g., thinks she can't prepare the food in a way her child will eat it).

Since Bandura's (1977, 1982) early studies of self-efficacy, research has investigated the influential role of self-efficacy beliefs in guiding behavior. Self-efficacy is a key concept in SCT. It predicts the initiation, continuation and maintenance of a behavior, even under adverse conditions, failure or stressful situations. A behavior such as feeding a young child in a healthful manner involves high parental self-efficacy. In everyday feeding a caregiver must have the knowledge, skills and confidence to provide the child with adequate nutrition, under numerous conditions, such as lack of environmental support, when the child is not willing to eat or is going through a tough developmental stage. A parent therefore will have to acquire skills to feed the child despite the numerous challenges of parenting. Studying parental self-efficacy may provide insight into improving children's eating behavior.

Self-efficacy has been strongly and consistently related to healthy eating behavior. Parcel and colleagues (1995) found that self-efficacy of the child accounted for 34% of the variance in the dietary behavior of third and fourth graders. Domel and colleagues (1996) found significant correlations between self-efficacy and fruit and vegetable consumption of fourth and fifth grade students (Domel et al., 1996). Havas and colleagues (1998) reported a 0.76 serving increase in fruit and vegetable consumption for every 1 standard deviation increase in self-efficacy in their study of fruit and vegetable intake among low-income WIC mothers (Havas, Treiman, Langenberg, Ballesteros, Anikler, & Damron, 1998). Resnicow and collegues (1997) found a small correlation (.12) between self-efficacy selection and fruit and vegetable consumption in third grade children (Resnicow et al., 1997). More recently Seth and colleagues (2008) found parental self-efficacy beliefs surrounding fruit and vegetable consumption to be the strongest

predictor (R^2=.12, beta=.24, p=.001) in their model of preschool children's fruit and vegetables intake (Seth et al., 2008).

Parental self-efficacy scales have primarily focused on general parenting skills and abilities rather than on specific parenting tasks or areas of parenting (Coleman & Karraker, 1997; Jones & Prinz, 2005). Bandura (1989) argued that self-efficacy is a task-specific and situational construct in which confidence varies depending upon the skills required or for the situation in which one is faced. Consistent with this point of view the review by Coleman and Karraker (1997) found the need for the development of measures to assess parental self-efficacy in specific parenting tasks, particularly when raising children. As children grow, parents experience many new and diverse developmental and emotional challenges.

A focus group study of 29 low-income parents of 3 to 5 year old children from Head Start, found that children, not the parents, were the ones who decided which foods were offered for meals and snacks (Hoerr, Utech, & Ruth, 2005). This is clear discrepancy from the division of responsibility promoted by Satter (2000), in which parents are responsible for the foods they offer their children and children are responsible for determining how much and if they will eat it. This control of mealtimes by the child negatively affected parental self-efficacy and the quality of the mealtime environment (Hoerr et al., 2005). Furthermore this barrier of child control prevented parents from offering certain foods, which is a parental mealtime responsibility. As has been previously discussed, it is important for parents to have self-efficacy to offer nutrient dense food because children's food preference relates to repeated exposure of the food. Altering self-efficacy can be done through performance enactment, vicarious experience, persuasion and minimizing emotional arousal. Performance attainment has been found to be the most effective at altering self-efficacy (Glanz et al., 2002). In a staff wellness project designed to improve staff self-efficacy in counseling WIC participants for prevention of pediatric obesity, staff involved in

new wellness activities themselves were more likely to counsel patients on their child's weight status and in being more physically active with their children. These same staff felt more supported to make healthy eating choices and engage in physical activity when compared to the non-intervention group (Crawford et al., 2004). In a different study elementary school children watched other children in a video preparing healthful snacks. This intervention increased self-efficacy behavior through vicarious experience. Pre/post measures reported were 18.6 vs. 20.4 ($p<.05$) for girls and 17.4 vs. 19.2 ($p<.05$) for boys (Saksvig et al., 2005). The Health Opportunities for Pre-School Children to Optimize Their Cardiovascular Health initiative presents the mother as an agent of change for her child and his or her environment. The intervention focuses on enhancing parenting skills and developing strategies to better manage their own weight, while having a positive influence on the child and their environment. Parental self-efficacy is an important construct and together with modeling and positive reinforcement is used to change behavior at different levels throughout the model (Jeor, Perumean-Chaney, Sigman-Grant, Williams, & Foreyt, 2002).

Role modeling

Parents serve as both providers and models in the feeding process. They are responsible for the selection of foods, serve as models of eating that children learn to imitate, and use diverse feeding practices and techniques to encourage their children's development of culturally appropriate eating patterns and behaviors (Savage, Fisher, & Birch, 2007). Children learn about eating through direct experience and by watching others. Observational learning occurs when the child watches the actions of another person, in this case the parent or another child, and the reinforcements that the person receives. While Birch (1980) observed that preschool children's consumption of vegetables was highly influenced by the selection and consumption of their peers (Birch, 1980), other researchers have found that adult modeling and an acceptable atmosphere

toward a food item increases preschool children's acceptance of that food item. Hendy and Raudenbush (2000) studied the effects of teacher modeling on preschool children's food acceptance. They found that a silent teacher model was ineffective. But that enthusiastic modeling (for example, addition of "Mmm! I love mangos!") was effective when not in direct competition with peer modeling. They tested the enthusiastic teacher model across five meals and found that it was sustained. The silent model and simple exposure dropped initial food acceptance after 3 to 5 meals (Savage et al., 2007). Studies in older children demonstrate similarities between parents' and children's food acceptance and food preference. For example, children's intake of fruit and vegetables was positively related to parents' fruit and vegetable intake, and parental modeling of healthy eating behavior was associated with low-fat eating patterns and lower dietary fat intake (Fisher, Mitchell, Smiciklas-Wright, & Birch, 2002). Research has also found an influence of parental role modeling on fruit juice and fruit and vegetable intake (Cullen et al., 2001; Young, Fors, & Hayes, 2004). Experimental evidence on parental role modeling in preschool children's preferences and choices is lacking. However one might expect parental modeling to have a stronger influence than that of other adults on preschool children's food intake.

Parental practices

Parenting involves the tasks of caring for and feeding one's children. Child feeding practices evolve as parents respond to the environment (Savage, Fisher, & Birch, 2007). The intergenerational transmission of feeding practices plays a strong role in what and how children are fed in different cultures. Child feeding practices are also influenced by the child's individual characteristics, such as age, gender, weight status and eating behavior. The interaction between the child and the parent during the feeding process will have a powerful influence on the child's development of food preference, intake patterns, diet quality, growth and weight status. In other

words, what a parent does and makes available has a direct influence on a child's health. Some practices are very positive, while others such as restrictive dietary practices can have an unintended negative effect (Birch & Fisher, 2000; Lee, Mitchell, Smiciklas-Wright, & Birch, 2001)

This dissertation study looked at parenting practices related to preparing and including fruits and vegetables in a child's diet. These include the process or actions related to making the food (fruits and vegetables) more available to the child and actually offering the food to the child.

Experimental studies with infants, children and adults provide evidence that exposure to the taste of a food increases the liking for it (Birch & Marlin, 1982; de Silva, 1988; Sullivan & Birch, 1994). Birch and colleagues reported that looking at the food was insufficient in providing this effect (Birch et al., 1987); however watching others consume the food increased consumption.

Rewarding a child for eating is one parental practice that has been transmitted from one generation to the next ("If you eat all of your vegetables, you may have dessert."). This parental tactic has received criticism in the psychological literature, and research has reported decreased liking for food items for which children are rewarded for consumption (Birch, Marlin, & Kramer, 1982; Birch & Marlin, 1982; Birch, Marlin, & Rotter, 1984). Wardle and colleagues looked at both reward feeding practices and taste-exposure in children 5 to 7 years of age and found that taste-exposure increased both liking and consumption of the vegetable ($p>.05$). The group that received a reward for consumption was not significantly different from the control group condition in experiencing liking for and consumption of the vegetable (Wardle et al., 2003).

Physical Environment

Fruit and vegetable availability and accessibility

Food accessibility and availability are also important predictors of child eating behavior. In general, children will choose to eat foods to which they are exposed and accustomed, and they tend to eat what is made available to them in their homes (Birch & Marlin, 1982; Birch, 1992; Birch et al., 1987). Parents are responsible for making food available to their children and therefore have a profound impact on their children's food preference and consumption (Patrick & Nicklas, 2005).

Availability of fruits and vegetables is positively associated with higher intake in older children (Baranowski, Cullen, & Baranowski, 1999; Cullen et al., 2003) and adolescents (Neumark-Sztainer et al., 2003). Hearn and colleagues (1998) found that cutting fruits and vegetables into bite size pieces and placing them within the child's reach increases consumption (Hearn et al., 1998). Neumark-Sztainer and colleagues (2003) found that home availability of fruit and vegetables had the highest correlation coefficient with fruit and vegetable consumption (r=.33). Of the 13 factors considered in their study as having possible direct effects on fruit and vegetable intake, only taste preference and home availability for fruits and vegetables were found to be meaningful and statistically significant (Neumark-Sztainer et al., 2003). Using a model of parental and child influences on children's intake of fruit and vegetables, Kratt and colleagues (2000) investigated the moderating affects of availability. Path analysis and multigroup structural equation modeling indicated that children in homes with higher availability of fruit and vegetables had greater motivation for fruit and vegetable consumption than children in homes with lower availability (Kratt et al., 2000). In another study, preference and accessibility (including availability and ready to eat) were found to be the strongest correlates for fruit and vegetable consumption among 6^{th} and 7^{th} graders (Neumark-Sztainer et al., 2003).

Chapter 3: Methods

HYPOTHESIS

This study had four hypotheses:

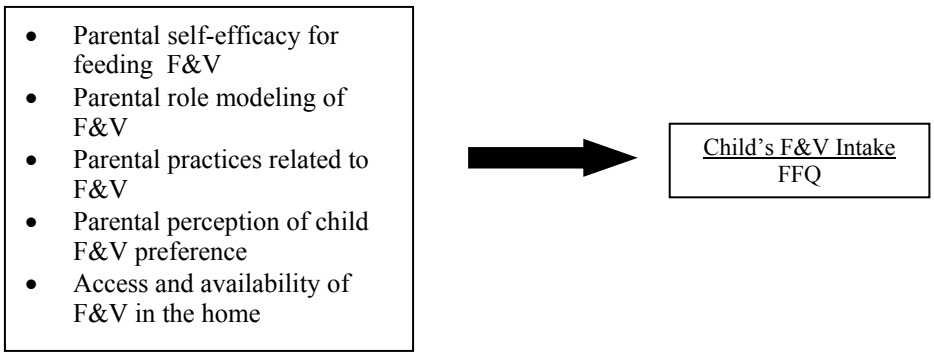
Hypothesis 1: The scales on the Feeding Your Preschooler Questionnaire (FYPQ) are each significantly correlated with the same scales when comparing data collected at two different time points, 2 to 4 days later, showing test-retest reliability of the FYPQ.

Time 1		Time 2
FFQ (food groups)	↔	FFQ (food groups)
Parental self-efficacy for feeding F&V	↔	Parental self-efficacy for feeding F&V
Parental role modeling of F&V	↔	Parental role modeling of F&V
Parental practices related to F&V	↔	Parental practices related to F&V
Parental perception of child F&V preference	↔	Parental perception of child F&V preference

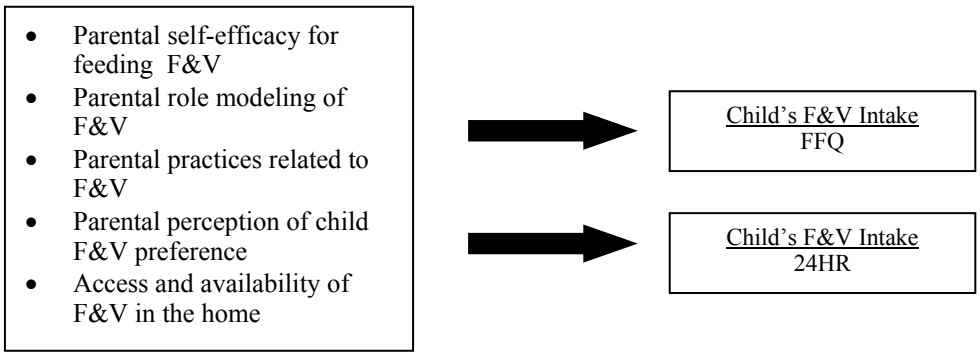
Hypothesis 2: Children's usual food consumption measures on the FFQ are significantly correlated with the corresponding eating behavior as measured by a 24-hour dietary recall, demonstrating construct validity of the FFQ.

FFQ		24HR
Milk	↔	Milk
Fruit	↔	Fruit
Vegetables	↔	Vegetables
Protein	↔	Protein
Grains	↔	Grains
Fruits and vegetables	↔	Fruits and vegetables

Hypothesis 3: Physical and social environment and personal factors are independently significantly related to child's fruit and vegetables intake as measured by the FFQ, demonstrating nomological validity.



Hypothesis 4: Fruit and vegetable intake as measured by the 24 hour food recall and the FFQ are equally predicted by the psychosocial determinants of eating behavior.



RESEARCH DESIGN

This research project employed two different study protocols. The first hypothesis was tested using a repeated measures design using survey data from two different time points administered 2-4 days apart. The second, third and fourth hypotheses were addressed using a cross-sectional study design, using the data from the first administration. Parental proxy reports were obtained through pen and pencil administration of the Feeding Your Preschooler

Questionnaire (FYPQ) survey and an in-person interview using a 24-hour multi-pass food recall (24HR).

PARTICIPANTS

Parents of preschool aged children served as a proxy who reported on their children's eating patterns and behaviors. Parents detailed what and how their children ate and they answered questions about how the feeding relationship evolves in their homes. Each parent reported for only one child within the age range of 2 to 5 years.

Participants were recruited from 10 different sources and reflected a variety of environments: the Mexican Consulate in Austin, Texas, an educational fair, the "Feria para Aprender" held by the Austin Independent School District, Austin Learning Academy at Linder Elementary, the Aspire program at Lucy Read Elementary, and the "Posada Esperanza" shelter for Hispanic women in Austin, Bagdad Early Head Start in Leander, Rawleigh Elliot Head Start in Georgetown, Round Rock Head Start in Round Rock, and the Liberty Hill Head Start in Liberty Hill, and through the researcher's friends and acquaintances. These programs were selected to represent a mainly Hispanic low-income population. The parent who spends the most time with the child was determined to be the main caregiver and was interviewed for the 24HR and asked to complete the FYPQ.

SURVEY ADMINISTRATION AND RECRUITMENT

Recruitment differed by location; each had a slightly different recruitment protocol. However all participants were interviewed using the multi-pass 24HR and then asked to complete the FYPQ on site and a second time within 2-4 days. The in-person interview took approximately 15-25 minutes. The self-administered FYPQ survey, that in some instances was read to participants, took 10-15 minutes to complete. Participants were given the second FYPQ

once they turned in the first FYPQ and were asked to fill it out within 2 to 4 days and return it. The surveys and 24HR were offered in both English and Spanish.

As an incentive for participation, all participants who completed the interview and questionnaires received a children's physical activity video and a brochure with dietary intake recommendations based on the USDA Food Guide Pyramid dietary guidance for this age group.

Human subjects approval was obtained from the University of Texas Human Subjects Committee for subject recruitment protocols, the consent form and questionnaires (both English and Spanish versions). Under this approval 135 participants were recruited for this study.

Following is a description of the recruitment protocol carried out at each site.

The Mexican Consulate

The Mexican Consulate agreed to allow the researcher and another colleague to recruit Mexican participants who were in the waiting room at the Consulate. A total of 15 participants were recruited from the Mexican Consulate. On two separate occasions, the researcher and a volunteer visited the Consulate. At that time researcher would approach to potential participants and ask if they were interested in participating in this research project while they waited. If they agreed to participate, they signed the consent form, and either the researcher or the research volunteer proceeded with the in-person 24HR interview. After completion of the interview, the participant completed the self-administered FYPQ. After handing in the completed self-administered FYPQ, participants were handed their incentives (the children's physical activity video and nutrition recommendations based on child's age and physical activity level according to the new food guide pyramid for preschoolers from the USDA). They also received a second copy of the survey and were asked to complete it within 2-4 days and return it to the researcher in a self-addressed postage paid envelope provided. All surveys and interviews at the Mexican Consulate were conducted in Spanish.

The Feria para Aprender

The Feria para Aprender (The Learning Fair) is a free event sponsored by the Austin Independent School District for Spanish speaking parents to learn how to support and become involved in their child's education. The event is set up by different age groups to provide information on early childhood development, elementary, middle, high school, and college. Several nonprofit agencies provide information on their services. The researcher obtained a table at the fair, which allowed for space for the in-person 24HR interview; a larger table was used for administration of the FYPQ. Two parents could be interviewed, while six parents could answer the self-administered FYPQ. Participants who agreed to take part in the research study read and signed the consent form. The researcher and a colleague with a doctoral degree in Health Education interviewed 28 participants. The interview was conducted in either Spanish or English. Upon completion of the interview, the participant completed the self-administered FYPQ. After returning the completed self-administered FYPQ, participants received their incentives, the children's physical activity video and the brochure with nutrition recommendations based on child's age and physical activity level according to the current food guide pyramid for preschoolers from the USDA. They were also handed the second survey, asked to complete it within 2-4 days and return it to the researcher in a self-addressed postage paid envelope provided.

Head Start Preschools

Four Head Start schools agreed to provide onsite recruitment at their monthly parent meetings. During the meeting, the researcher explained to parents all the aspects of this research study and invited them to participate. If they decided to do so, they signed the parental consent

form and were interviewed on site. The interview was conducted in either Spanish or English by one of four trained researchers. After the interview (multi-pass 24HR), they answered the FYPQ. Parents were given the FYPQ survey to take home and asked to answer it a second time two days from the first administration. After returning the completed self-administered FYPQ, to the Head Start director or parent specialist, participants received their incentives, the children's physical activity video and the brochure with nutrition recommendations based on child's age and physical activity level according to the current food guide pyramid for preschoolers from the USDA. A total of 47 parents participated in the research study.

Austin Learning Academy at Linder Elementary School, and the Aspire program at Lucy Read Elementary School

The teachers from Austin Learning Academy at the Linder Elementary School and from the Aspire program at the Lucy Read Elementary School agreed to provide onsite recruitment during their class time. During the class, the researcher explained to parents all the aspects of this research study and invited them to participate. If they decided to do so, they signed the parental consent form and were interviewed on site. The interviews were conducted in either Spanish or English by the researcher or by one of two trained research volunteers. After the interview (multi-pass 24HR), they answered the FYPQ. Parents were given the FYPQ survey to take home and asked to answer it a second time two days from the first administration. They were then asked to return the survey to the teacher 2-4 days later. A week later the researcher returned to the school to pick up surveys and to deliver incentives to each participant. A total of 36 parents participated in the study, 17 from the Lucy Read Elementary School and 19 from the Linder Elementary School.

"Posada Esperanza"

Posada Esperanza is a shelter for homeless Hispanic women in Austin, Texas. Two mothers were interviewed at Posada Esperanza. At the time of the interview only two mothers of preschool children were living at the shelter. The researcher set up a time to meet with these mothers. Upon arrival at the shelter, the researcher asked the mothers if they wanted to take part in the research study. The researcher read the consent form to the mothers, asked if they wanted to participate and had them sign it. They were then interviewed for the 24HR separately. Neither of these mothers was comfortable reading the FYPQ survey, therefore the researcher read the survey to them and helped them fill it out. Two days later the researcher came back to Posada to readminister the FYPQ. Only one mother completed the survey a second time.

Researcher's Friends and Acquaintances

Seven direct personal contacts were made to friends and acquaintances of the researcher. These mothers agreed to participate in the study, signed the consent form and were interviewed. Following the interview, the researcher asked them to fill out the survey. These sessions were conducted at a fast food restaurant and at one home. At the end of this session they were asked to fill out the survey a second time within 2-4 days. The researcher then contacted them to retrieve the surveys. Once the researcher received the survey, the participant was given the incentive and the brochure with her child's nutrition recommendations.

Extra Recruitment for Test-retest

Since two surveys were not returned all of the time (n=61), a special recruitment group was obtained from Bagdad Early Head Start in Leander. This group of participants (n=13) was only administered the FYPQ, twice within 2-4 days. This group consisted of low-income Hispanic parents of preschool children. They were recruited at a different parent meeting than

the one used in the Pilot study. This meeting was held in February 2009. Parents who agreed to participate signed the consent form and filled out the FYPQ at the parent meeting, and the time two survey was given to them to answer at home. They agreed to return the survey to the Head Start director or parent specialist within 2 to 4 days. They also received the children's physical activity video and nutrition recommendations for filling out the survey the second time.

SAMPLE SIZE

The number of subjects to include in a validation study can vary depending on the statistical method being used to assess validity. This study used the correlation coefficient. The sample size therefore depended on the expected associations between the two methods. Based on the correlation method, validation studies have used a sample size between 100 and 200 subjects. Cade and collegues (2001) found studies with anywhere from 6 to 3750 subjects in their review of the literature. Willett (1998) suggest that in general "if a strategy using a small number of replicates per subject is employed, the number of subjects needs to be increased to maintain the same precision of the corrected correlation coefficient (assessed by standard error or 95% confidence interval). However, the sample size used will inevitably depend on the resources one has to conduct the study. "

To determine the appropriate sample size for the current study, three separate power analyses were conducted. The first power analysis was performed to determine the sample size needed for the test-retest reliability of the FYPQ. Since all the variables are continuous, Pearson's statistic was deemed appropriate for this test. Previous research on this topic has found correlation coefficients in the order of .5 to .7 (Willet, 1998). Although these might seem low, this level of reproducibility is comparable to that of many biological measurements made among free-living subjects (Cade et al., 2001; Willett, 1998). Studies in preschool children have found correlations ranging from r= .1 to .8 (Huybrects et al., 2006; Klohe et al., 2005; Metcalf et al.,

2003; Basch et al., 1994; Treiber et al., 1990). In these studies the time frame between administrations of the two FFQs varied from 1 week to 1 year. The current study expected to obtain a Pearson's r of at least .5. Using Study Size Determination (SDS) with α of .05, a β of .1 (power of 90%), an average theoretical statistic for r between .5 and .7, based on the previous literature, the required sample size was 82.

The second power analysis calculated the required sample size for the Pearson's correlation between the 24HR and FFQ, in order to assess the convergent validation of the FFQ instrument against a superior instrument. Previous literature indicated that validity correlations range from .4 to .7 (Nelson, 1997; Willett, 1998). Validation studies in preschool children have found correlations ranging from r=.1 to .8 (Huybrects et al., 2006; Klohe et al., 2005; Parrish et al., 2003; Blum et al., 1999; Stein et al., 1994; Stein et al., 1992; Treiber et al., 1990). Most of these studies looked at nutrients; only the study of Klohe and colleagues (2005) assessed food group correlations. The current study expected to obtain minimum food group correlations of .4 between the two questionnaires. Using SamplePower, a null correlation of .4 and a true correlation of .6 (based on the previous literature), the required sample size was 112.

The third and final power analysis was performed to determine the required sample size for a sequential Ordinary Least Squares Regression, containing two steps. The required sample size to detect a 10% change in the first step of the model – containing acculturation and food security was determined to be 105. The second step of the model also requires 105 subjects to detect a 10% change. This step includes the variables of interest, parental self-efficacy to feed a child fruits and vegetables, parental perception of child preference, parental role modeling, parental practices, and home environment, which is made up of the fruit and vegetable availability and accessibility indices, for a total of six variables. This sample size yields power above .9 for the overall model (6 total predictors with an overall model effect of .20). However,

Tabachnick and Fidell (2001) recommend a minimum sample size of 112 to test individual predictors within the above model.

Given the possibility of missing data or attrition during the test-retest reliability portion of the current experiment, 120 subjects were deemed sufficient to satisfy power requirements.

INSTRUMENTATION

Data sources for this study include the Feeding Your Preschooler Questionnaire (FYPQ) and a 24-hour multi-pass food recall (24HR).

The FYPQ Instrument

The FYPQ contains survey items from three different sources: the University of Texas Nutrition Education "Feeding Your Toddler and Young Child Questionnaire", "The Home Nutrition Questionnaire" and the "Fruit and Vegetable Accessibility and Availability Index".

All of the items on the FYPQ have been translated into Spanish and back-translated into English for accuracy. They have also been field tested with English and Spanish speakers for readability and comprehension. The indices within the FYPQ are described below.

The Preschool Food Frequency Questionnaire (FFQ)

The FFQ consists of 65 food items within one of the following food groups: dairy, fruits, vegetables, sweets, sweetened drinks, iron-rich foods, and/or WIC foods. It was developed by the University of Texas Nutrition Education Team as part of the Epidemiological Study of Toddler Feeding Practices for WIC (Seth et al., 2007). This survey assesses food intake of the preschool child as reported by their parents. The FFQ is based on other quantitative and semi-quantitative food frequency questionnaires, such as those developed by Willett (Willett et al., 1985) and Block (Block, Hartman, & Naughton, 1990). The FFQ is unique in its development as it has been

especially designed for a low literacy group, is sensitive to Hispanic food intake, and, unlike other food frequency questionnaires, has been based on frequency of intake during the previous seven days, which aids in better recall of foods eaten.

The FFQ does not include portion sizes of all of the food items or food groups. The FFQ was designed to assess specific foods from certain food groups: milk, fruits, vegetables, iron-rich protein foods, iron-fortified cereals and grains, baked goods and sweets, snacks, and drinks. However, it incorporates items from the USDA food behavior checklist that require estimation of quantities consumed of certain foods, such as milk and juice, that were deemed important for the study of preschool feeding practices. From the food groups on the FFQ, the following pyramid food groups can be extracted for comparison between the 24HR and the FFQ. These groups are milk, fruits, vegetable, grain, and protein. Table 5 describes how the food items on FFQ are grouped into each of the food pyramid groups.

Table 5 *Pyramid Food Group Categories for Food Items on FFQ.*

Pyramid Food Group	Food Item
Milk	Chocolate or other sweetened milk, hot or cold; cheese, plain, on a sandwich, or cottage cheese; sweetened yogurt; ice cream (cone, sandwich, shake or sundae); pudding, custard or flan.
Fruits	Apples, applesauce, or pears; bananas or plantains; cantaloupe, watermelon; grapes; oranges (Clementines, tangerines, mandarins or navels); peaches or apricots; pineapple; mango; kiwi; papaya; lemons or limes; berries; dried fruit, raisins or prunes.
Vegetables	Broccoli; carrots; cauliflower; green beans; cabbage or coleslaw; peppers green, red or hot; zucchini or other squash; tomatoes, tomato sauce or salsa; corn or hominy; cucumbers; jicama; lettuce or salad greens; spinach or other dark greens;

Pyramid Food Group	Food Item
	french fries, fried potatoes, tater tots, home fries, or hash browns; potatoes, boiled, mashed or baked; sweet potato; avocado; peas or limas beans; mixed vegetables.
Protein	Egg; dark meat chicken; beef; liver; cooked beans or lentils; peanut butter.
Grains	Unsweetened cereal, cold or hot (such as Cherrios, Kix, plain oatmeal, cream of wheat); sweetened cereal, cold or hot (such as Fruit Loops, Cocoa Puffs, Frosted Flakes, flavored oatmeal); iron fortified bread or grains, baked goods (such as cakes, cookies, pies, muffins, donuts, brownies); waffles, pancakes, or french toast with syrup; packaged cookies (such as Nilla Wafers, graham crackers, Maria cookie, animal crackers, Fig Newtons); packaged cookies with added fat (such as Oreos, Chips Ahoy, etc.), chips (potato or corn chips, Cheetos, tortilla chips, pork skins, spicy chips, etc.); Goldfish; crackers; popcorn.

The following assumptions are made to compare frequencies from the FFQ to the servings obtained on the 24HR. (a) A serving is defined for each food group as it is defined by the USDA food guide pyramid (Marcoe, Juan, Yamini, Carlson, & Britten, 2006). For example one medium sized fruit is equal to one fruit serving, a slice of bread is defined as one serving from the grain group, a cup of milk is defined as a serving from the milk group, etc. (b) Since the FFQ does not quantify serving sizes, data obtained by the FFQ for each food group index are summed and divided by seven to determine the average frequency per day. (c) It is assumed that each frequency count is equal to one serving per day as defined by the USDA food guide pyramid for this age group. Therefore the data obtained by the FFQ will reflect daily average intake. The data obtained are used as a continuous variable.

Parental self-efficacy to feed child fruit and vegetables

The parental self-efficacy scale is composed of 8 items, scored on a 4-point Likert scale from "I don't feel sure", "I feel a little sure", "I feel fairly sure" and "I feel very sure". The questions relate to feeding a child fruits and vegetables and are anchored by the stem "Given the way your life is now, how sure do you feel you can do each of these things?" Data obtained are summed, and an average value is obtained from the 8 items. The data obtained are used as an interval variable. Previous research has found a coefficient alpha of .86 (Evans et al., 2008).

Home nutrition questionnaire

The home nutrition questionnaire was developed by Dave and Evans (Dave, Evans, Condransky, & Williams, under review; Evans, Dave, Tanner, Duhe, Condrasky, Wilson, Griffin, Palmer, & Evans, 2006) and measures home, parental and interpersonal factors related to children's fruit and vegetable intake. Three subscales are included in the FYPQ. Parental perception of child preferences includes 5 items ("My child likes to eat fruits") and has a coefficient alpha of .78; parent practices, 4 items ("I include fruits and vegetables in meals for my child at home") with a coefficient alpha of .84, and parental role modeling, 2 items ("My child sees me eating fruits and vegetables") with a coefficient alpha of .79 (Evans et al. 2006). These items are scored on a 5 point scale from "never", "rarely", "sometimes", "often" and "always". Items are summed for each index, which is treated as a continuous variable.

Fruit and vegetable accessibility and availability index

The accessibility of fruit and vegetables in the home is assessed by four items, dichotomized into yes/no responses. These items inquire about the presence of fruits and vegetables in the home that are ready to eat (out in the open, in the refrigerator, and pre-prepared items). The accessibility items were developed by Hearn and colleagues (1998). The availability

index for fruits and vegetables in the home was developed by Kratt, Reynolds and Shewchuk (2000). The index is composed of five items regarding the availability of generic types of fruit and vegetables (puree, juices, fruit, salad, and raw and cooked vegetables) in the home within the past week. The index score is calculated by summing the responses to all 9 items, resulting in a continuous variable. A higher score indicates higher availability and accessibility of fruit and vegetables. This instrument has been validated with older children and adults (Hearn et al., 1998). Previous research has found a coefficient alpha of .69 for the combined scales (Hearn et al., 1998).

Food Insecurity

According to the Life Sciences Research Office's Report of Nutritional Assessment, food insecurity can be defined by the limited or uncertain availability of nutritionally adequate and safe food or limited or uncertain ability to acquire acceptable foods in socially acceptable ways (Anderson, 1990). For this study, food insecurity has been conceptualized as the perceived state of or risk of being unable to provide acceptable or nutritionally adequate food for one's family or self. The two items used in the FYPQ are "Do you run out of food before the end of the month because you can't afford to buy more?" and "Do you worry that you will run out of food before you can afford to buy more?" These items have been previously validated by Murphy and colleagues (2001) and are widely used by the USDA in national surveys (Nord, 2002; Nord, Andrews & Carlson, 2006). The actual language on the questions was modified for better comprehension by the study participants. The responses to these items were "always", "sometimes", and "never". The index is obtained by summing the responses and categorizing individuals into food secure (index = 0) and food insecure (index ≥ 1). Previous research has found a correlation coefficient of .85 (Murphy et al., 2001).

Demographic variables

Demographic variables include child's age, child's gender, participant's relationship to the child, child's weight status, participants' gender, ethnicity, highest level of education achieved, employment status, marital status, number of people in the household, WIC enrollment, other food assistance programs enrollment, and total household income. The FYPQ also includes an acculturation proxy, the assessment of the main language spoken at home (Dixon, Sundquist, & Winkelby, 2000).

Child's age is defined as the child's age in years at the time of completion of the survey. Child's gender refers to the child's female or male status. Participant's relationship to the child is defined as the relationship between the child and the person completing the survey. Child's weight status identifies whether or not the participant has been told by a medical or health care professional at any time in the child's life that the child is overweight, underweight or neither.

Participant's gender refers to the gender (male or female) of the survey respondent. Participant's ethnicity is defined by the participant's social construction and identification with a particular group with which they share common cultural traits (Foster & Sharp, 2002). In this study, it is measured with five response categories and one option to write in any other category not included. These categories are White, Black, Hispanic or Latino, Asian or Pacific Islander, Native American or Alaskan, and other. Respondents who checked more than one category, were included in the study if they checked Hispanic. The data collected from this item are ordinal in nature. Participant's highest level of education refers to the highest level of education achieved by the participant. Seven categories are available as options for the participant: 1^{st} to 6^{th} grade, 7^{th} to 9^{th} grade, 10^{th} to 12^{th} grade, GED, high school graduate, some college, and college graduate. The data collected from this item are ordinal in nature.

Participant's employment is measured as "Do you have a job?" The response options include "yes, fulltime", "yes, part-time", and "no". Participant's marital status is defined using four major categories: single, never married; married or living as married; widowed, and divorced. Number of people in the household is defined as the number of people, including adults and children, who currently live in the household.

WIC enrollment refers to current or ever enrollment in the Women's Infant and Children's Supplemental Nutrition Program. Enrollment in other food assistance programs refers to enrollment in food assistance programs other than WIC, such as food stamps, free lunch or food pantries.

Total household income is operationalized as the total amount of income the household receives per month before taxes and is measured as eight levels ranging from $0-999 a month to $9000 or more a month. These data were used as a proxy for socio-economic status and to define WIC eligibility when used in correspondence with the number of people in the household. Participants who are at 200% over the 2008 poverty line or below were included in the study.

Acculturation refers to the process of adapting to the behaviors, beliefs and cultural patterns of a new group, home country or culture. Neuhouser and colleagues (2004) validated the item "what is the main language spoken in your home?" as an acceptable indicator of acculturation. For Hispanics in the United States, if the main or primary language spoken at home is Spanish, their level of acculturation is said to be low. If they have adapted to the use of English as their primary language it can be assumed that their acculturation level is high (Dixon, Sundquist, & Winkleby, 2000; Manzur, Marquis, & Jensen, 2003; Neuhouser, Thompson, Coronado, & Solomon, 2004).

Table 6 provides a summary of the survey components, including unpublished reliability coefficients from previous pilot work and published research.

Table 6: *Summary of FYPQ Subscales/Indices*

Variables	# Items	Reliability coefficient	Potential range or score	Total score calculation	Meaning of a higher score
FFQ food group indices	65 divided into food groups: dairy (n=5), fruits (n=14), vegetables (n=19), sweets (n=11), sweetened drinks (n=4), snacks (n=4), iron- rich foods, and/or WIC foods (n=9)	N/A	Varies by food group	For each food group, sum all items in the category divided by 7 to compute the average # servings per day	More servings from the food group
Parental self-efficacy to feed child fruits and vegetables	8	$\alpha = .86$[a]	4-point Likert scale (I don't feel sure = 0 to I feel very sure = 3)	Average response of the 8 items	Greater self-efficacy

Variables	# Items	Reliability coefficient	Potential range or score	Total score calculation	Meaning of a higher score
Home Nutrition Questionnaire subscales:					
Parental role modeling	2	α = .79[b]	5-point Likert scale (Never = 0 to always = 4)	Sum of all items	Healthy weight promoting environment
Parental practices	4	α = .84[b]	5-point Likert scale (Never = 0 to always = 4)	Sum of all items	Healthy weight promoting environment
Parental perception of child preferences	5	α = .78[b]	5-point Likert scale (Never = 0 to always = 4)	Sum of all items	Healthy weight promoting environment
F&V availability accessibility index	9	α =.69[c]	Dichotomi-zed (1=yes or 0=no)	Sum of all items	Greater availability and accessibility

Variables	# Items	Reliability coefficient	Potential range or score	Total score calculation	Meaning of a higher score
					of fruit and vegetables
Food Insecurity	2	α = .85[d]	(Always = 2, sometimes = 1or never = 0)	Sum of response to items	Greater food insecurity
Acculturation	1		Main language spoken at home (English=3, Spanish=1, both=2)		Highly acculturated

a. Seth, J. G., Evans, A. E., Harris, K.K., Loyo, J. J., Ray, T. C., Spaulding, C. J., & Gottlieb, N. H. (2007). Preschooler feeding practices and beliefs: differences among Spanish- and English-speaking WIC clients. *Family and Community Health, 30,* 257-270.

b. Evans, A. E., Dave, J., Tanner, A., Duhe, S., Condrasky, M., Wilson, D., et al. (2006). Changing the home nutrition environment: Effects of a nutrition and media literacy pilot intervention. *Family & Community Health. Nutrition and Health. 29,* 43-54.

c. Hearn, M..D., Baranowski, T., Baranowski, J., Doyle, C., Smith, M., Lin, L.S., et al. (1998). Environmental influences on dietary behavior among children: Availability and accessibility of fruit and vegetables enable consumption. *Journal of Health Education, 29*, 26-32.

d. Murphy, S.P., Kaiser, L.L., Townsend, M.S. & Allen, L.H. (2001). Evaluation of validity of items for a food behavior checklist. *Journal of the American Dietetic Association,101*, 751-756.

24-hour dietary recall (24HR)

The 24HR has been used as a superior standard in validation studies of food frequency questionnaires (Cade et al., 2001; Hoelscher, Day, Kelder, & Ward, 2003; Rockett et al., 1997; Willett, 1998). For this study, a standard 24HR form was used to record all foods and drinks a participant's preschool child consumed in the previous 24 hours. The form was adapted from the standard form that has been used by USDA since 1965 in nationwide food consumption surveys (Pao, Sykes, & Cypel, 1989) and from the Homemaker's 24HR developed by The Agriculture Extension of The University of Tennessee. The adaptation of the form permits the use of the multi-pass method, in which participants are asked three times about the same food item in an effort to improve memory recall of the items consumed in the previous 24 hour period (Chambers, Godwin, & Vecchio, 2000). Portion size estimation was facilitated by the use of a food recall kit that included three NASCO food models (a 1 cup serving, a ½ cup serving and 3 oz. serving of protein group), an 8 oz glass of milk, a 6.75 ml juice box, a 8-7/8 inch plate, a 5 oz. bowl and four standard size measuring cups (1 cup, ⅔ cup, ½ cup, and ¼ cup), and four standard size measuring spoons (1 Tbs., 1 tsp., ½ tsp., and ¼ tsp). In addition two cups of Cheerios cereal were provided to help participants calculate serving amounts. Interviews were conducted in either English or Spanish depending on respondents' needs. Four research volunteers were trained and certified to administer the 24-hour dietary recalls.

Training and certification for data collection utilizing a 24-hour dietary recall

Three research volunteers were trained in November 2007 before collecting data for the pilot study. The initial training included definition, components, setting, and procedures for collecting 24HR. The procedure section was very specific. It included details on how to start the interview, a description on how to describe food items, to determine the amount of food eaten, and a final review of all items obtained in the recall, using probes to elicit food items that could have been missed or forgotten by the parent or caregiver being interviewed *(See appendix C).* After the volunteers were acquainted with the procedure, they observed a trained degreed nutritionist while she interviewed one of them. Following the observation, the volunteers had the opportunity to practice on each other. Once they were comfortable with the form and procedures they were evaluated by the degreed nutritionist and proceeded to collect data for the pilot study. Eighteen months after the pilot study the volunteers were invited to take a review course to prepare them for their certification. One additional volunteer was trained at this time. Volunteers were certified by a Ph.D. Public Health Nutritionist at the University of Texas at Houston, School of Public Health, Austin Regional Campus, Susan and Michael Dell Foundation for Healthy Living.

Food Intake Analysis System (FIAS)

Data obtained by the 24HR instrument were analyzed for pyramid food groups using the Food Intake Analysis System (FIAS) (FIAS, 1998). FIAS is a computer assisted food coding and nutrient analysis system widely used in research studies, such as the Continuing Survey of Food Intakes by Individuals in 1994-96, and in 1999 and the NHANES. It was developed at the Dell Center for Healthy living by the University of Texas, School of Public Health, Human Nutritional Center. FIAS provides diverse dietary output ranging from the nutrient level to pyramid food groups. The FIAS database includes the Survey Nutrient Database developed by

the USDA and the USDA primary data set. FIAS contains over 7,300 foods and 52 nutrients (Evans, personal communication 2009).

FIAS served to code the data obtained from the 24HR. The five variables are extracted milk, fruits, vegetables, protein, and grains. These data were imported into SPSS 16.0 and compared to the data obtained from the FFQ. Only the principal researcher captured these data in FIAS to minimize errors.

DATA ANALYSIS

Following data collection, the data from the FYPQ and the pyramid food group obtained from FIAS were entered into SPSS 16.0 for analysis. Shapiro-Wilks and normality plots were run on all the food group variables to examine normality. All data were positively skewed and showed some degree of kurtosis. Therefore non-parametric tests were employed in the analysis. For the test-retest reliability, the Wilcoxon signed rank test was used to compar the median frequencies per day of food groups at time 1 versus time 2. Spearman's correlations were used to examine the test-retest reliability of the FIAS food group variables and the psychosocial variables on the FYPQ between time 1 and time 2. All scales on the FYPQ were tested for internal consistency using Cronbach's alpha coefficients. In addition, an alternative form of analysis called the Bland-Altman method was used to observe the degree of agreement between the two time points on the FIAS food group variables. Cade and colleagues (2001) recommend using Bland-Altman plots in addition to correlation coefficients. Correlation coefficients measure the degree of association between two measures but not necessarily whether the two measures agree. This method can determine if there is a systematic difference between the administrations of the questionnaire and to what extent the two administrations agree. It also can assess whether the difference between the two administrations varies across the range of intake and whether the extent of agreement differs for low intakes as compared with higher intakes. The method uses the

mean difference and the standard deviation of the difference. For test-retest purposes, a plot of the difference against the mean of the two administrations was constructed and visually analyzed. The overall mean difference indicated if the methods differed (either over- or underestimating). The limits of agreement (mean difference ± 2SD) showed how well the two administrations agreed.

For the validation study, Wilcoxon signed rank test examined differences in food groups medians between the 24HR and the FFQ, and Spearman correlations, the associations for construct validity. In addition, a Bland-Altman analysis was used to assess the level of agreement between the milk scores between the 24HR and the FFQ, because this was the only variable with the same scale measure (cups) on the two surveys. A range of agreement was defined as mean bias ± 2 standard deviations. Cross-classification of food groups servings into same, same or adjacent, or opposite quartiles and the degree of association was measured using a contingency table analysis between the FFQ and the 24HR.

Weighted least squares regression (WLSR) determined the relationship between psychosocial constructs and fruit and vegetable intake of the child as measured by the FFQ and by the 24HR separately. A correlation matrix is presented to view the relationships among the variables. Following the WLSR analysis for both intake methods (24HR and FFQ), a table compared the regression coefficients (zero-order correlations, regression weight and the model R^2) for both methods for fruit and vegetable intake.

All data with the exception of the WLSR were analyzed using Statistical Package for the Social Sciences version 16.0 for Windows. Significance levels were set at <.05. WLSR was analyzed using Mplus 5.0.

Table 7 *Summary of Statistical Methods for Hypothesis Testing*

Hypothesis	Statistical methods
1) The scales on the FYPQ are each significantly correlated with the same scales when comparing data collected at 2 different time points, 2 to 4 days later, showing test-retest reliability.	Wilcoxon signed rank test compared medians at time 1 versus time 2. Spearman's correlation coefficients between time 1 and time 2 were calculated for each question. In addition, data were grouped by pyramid food group categories. Bland-Altman plots and agreement were calculated for each of the 5 food groups milk, fruit, vegetable, protein and grain.
2) Children's usual eating habits as measured by the FFQ is significantly correlated with eating behavior as measured by the 24-hour dietary recall, demonstrating construct validity.	The medians and the interquartile range of the 24HR and the FFQ plus their correlations are provided. Wilcoxon Signed rank test compared the medians obtained from the 24HR to the FFQ. Spearman correlation coefficients were used to test the associations between the FFQ and the foods recorded on the 24HR for each of the five food groups. Participants were also ranked according to the FFQ and 24HR for milk, fruit, vegetable, protein and grain intake. In

Hypothesis	Statistical methods
	addition, a Bland-Altman plot and agreement were calculated for the milk group.
3) Physical and social environment, personal factors are independently significantly related to child fruit and vegetable intake, demonstrating nomological validity.	WLSR analysis determined the relationship between the physical and social environment and personal factors and the consumption of fruit and vegetables as measured by the FFQ.
4) Fruit and vegetable intake as measured by the 24HR and the FFQ are equally predicted by the psychosocial determinants of eating behavior.	Following the WLSR analysis for both intake methods (24HR and FFQ), a table compared the regression coefficients for both methods for fruit and vegetable intake.

PILOT STUDY FINDINGS

Overview

A pilot study was conducted to ascertain the feasibility of recruitment and administration of the preschool food frequency questionnaire (FFQ) and the 24-hour food recall (24HR). The data were analyzed as outlined in the previous section, with the exception of ranking of subjects according to intakes, construction of Bland-Altman plots and OLSR due to the small sample size included in this pilot. The pilot provided an initial examination of the hypothesized relationships. The instruments, recruitment protocols, and analysis plan were identical to that of the dissertation.

Methods

Twenty-six parents of preschool children in Central Texas (n=26) were interviewed for this study. The group was comprised of 24 mothers, one step father, and one father. The mean age of the parent interviewed was 31 years. Four (15.4%) of the parents interviewed described themselves as White and 76.9% as Hispanic. Two (7.7%) did not report their ethnicity on the survey.

Before the pilot study, six research volunteers were trained to administer the 24HR. Participants were recruited from the Bagdad Early Head Start program in Leander, from a group of friends, and from a private preschool in Round Rock, TX. Parents were interviewed according to the multi-pass 24HR protocol by a trained research volunteer. For every interview, measuring cups and food models were provided to help with calculations of portion size and to aid in memory recall.

Following the 24HR, parents were asked to fill out the FYPQ and to complete it again two to four days later. Variables and scales from the FYPQ have been described earlier in this

chapter. In return for their participation, each parent received a child's physical activity DVD and nutrition advice from the principal investigator who is a trained nutritionist.

Following the data collection, the 24HR data were coded by the principal investigator and entered into FIAS to obtain five pyramid food groups (fruit, vegetables, milk, protein and grains). The two time periods of the FYPQ were analyzed using SPSS version 16.0. Data for the test-retest reliability study were obtained from the administration of the survey at time one and time two. Reliability coefficients were calculated for each of the scales: parental self-efficacy, child preference, parental role modeling, and parental practices.

For the validation study, Spearman and Pearson's correlations were used to compare the five pyramid food groups obtained with FIAS with the FFQ data categorized into the same five pyramid food groups. The 24HR provided serving sizes and the FFQ provided frequencies.

Finally a correlation matrix was obtained to test the nomological validity of the FYPQ constructs, namely parental self-efficacy, child preference, parental role modeling, parental practices, fruit and vegetable accessibility and availability index, and fruit and vegetable intake as measured by the 24HR and the FFQ.

Results

The pilot study included 19 participants recruited from the Bagdad Early Head Start program in Leander, Texas; seven other mother-child dyads included friends and two mothers from a private preschool. Fifty percent reported Spanish as the main language spoken at home.

Nineteen of these parents had their children enrolled in a Head Start program. The children's ages ranged from 2 to 5 years of age with a mean of 4.5 yrs. More than half of the children were boys (61.5%), and only three parents reported ever having been told by a health care provider that their child was overweight.

Twenty five parents completed both the 24HR and the FFQ. Nineteen (76%) parents completed both time one and time two FYPQ. Table 8 summarizes the demographics measures of the pilot sample.

Table 8 *Pilot Study Demographic Measures (n=26)*

	Total/Average	%	Min	Max
Child's age	4.5 (±0.83)		2	5
Gender				
Girls	10	38.5		
Boys	16	61.5		
Parent's age	31.5 (±5.23)		22	42
Parent's gender				
Mothers	24	92.4		
Fathers	2	7.6		
Parent's ethnicity				
Hispanic	20	76.9		
White	4	15.4		
Did not answer	2	7.7		
Parent's marital status				
Married	20	76.9		
Single	3	11.5		
Divorced	1	3.8		
Did not answer	2	7.7		
Parents education level				
1-12th grade	6	23.0		
Some college	10	38.5		
College graduate	9	34.6		
Did not answer	1	3.8		
Parent's employment status				
Full-time	10	38.5		

	Total/Average	%	Min	Max
Part-time	5	19.2		
Unemployed	10	38.5		
Did not answer	1	3.8		
Monthly household income				
$0-999	1	3.8		
$1,000-1,999	7	26.9		
$2,000-2,999	5	19.2		
$3,000-3,999	1	3.8		
$4,000-5,999	2	7.7		
$6,000-8,999	2	7.7		
$9,000 or more	5	19.2		
Doesn't know	2	7.7		
People living in the home	4.32 (±0.90)		3	6
Main language				
Spanish	13	50.0		
English	12	46.2		
Did not answer	1	3.8		
Food assistance participation				
WIC	10	38.5		
Other	3	11.5		

Test-Retest Reliability

Table 9 shows the means or medians obtained for variables measured by the FYPQ. The large standard deviations obtained for some of the variables are probably due to the small sample size and some outliers. Data were not normally distributed for the majority of the variables, Pearson and Spearman correlations were used as appropriate based on the measurement of skewness and kurtosis (see Table 9). The FYPQ was administered twice within a four day

window. Nineteen (73%) of the initial 26 participants completed the survey a second time. The data for the reproducibility study were analyzed for the 19 participants that completed both surveys.

Table 9 *Pilot Study Test-Retest Reliability Means, Medians and Skewness Table Pilot Study (n=19)*

Item	Time 1 Mean (±SD) or Median (IQR)	Time 2 Mean (±SD) or Median (IQR)	Measure of Skewness at Time 1
Milk cups/day	2.67 (±1.03)	2.72 (±0.75)	-0.32
Milk frequency [c]	2.00 (2.00-2.00)	2.00 (2.00-2.00)	-4.24
Milk type [c]	2.00 (1.00-3.00)	2.00 (1.00-3.00)	0.68
Juice oz/day	10.44 (±5.54)	11.56 (±9.38)	0.51
Juice type [c]	1.00 (1.00-2.00)	1.00 (1.00-2.00)	-0.21
FFQ Fruit	2.00 (1.18-3.36)	1.86 (0.97-2.93)	1.28
FFQ Vegetables	1.79 (0.86-3.43)	1.50 (0.97-2.61)	2.10
FFQ Dairy	1.25 (±0.90)	1.27 (±0.91)	0.56
FFQ Protein	1.43 (1.00-2.29)	1.38 (0.96-1.86)	0.54
FFQ Grains*	3.29 (±1.52)	2.79 (±1.26)	0.68
FFQ Candy	9.00 (4.75-13.25)	8.00 (4.75-12.00)	0.91
FFQ Snacks	11.56 (±6.03)	9.06 (±6.31)	-0.01
FFQ Sweetened beverages	3.61 (±2.40)	3.56 (±2.31)	0.43
FFQ Water	7.00 (4.50-7.00)	7.00 (3.75-7.00)	-1.44
Parental self-efficacy	1.74 (±0.51)	1.83 (±0.57)	-0.11
Parental perception of child preference	9.94 (±3.05)	9.78 (3.34)	0.10
Parental practices	11.00 (7.00-14.00)	11.00 (9.00-13.00)	-0.23

Item	Time 1 Mean (±SD) or Median (IQR)	Time 2 Mean (±SD) or Median (IQR)	Measure of Skewness at Time 1
Parental role modeling*	4.52 (±2.41)[a]	5.58 (±2.09)	-0.09
Food security index	0.45(±0.47)	0.42(±0.48)	0.23

* Significantly different time 1 versus time 2 (P <.05)
[b] IQR= interquartile range (25^{th} -75^{th} percentiles).
[C] Categorical type data

Table 10 shows the correlations obtained for each survey item at time 1 and time 2, and scale reliability of the indices. Spearman correlations for categorical variables ranged from r=-.06 for milk frequency to r=.96 for milk type. Spearman correlations for skewed variables ranged from r=.72 for candy to r=.93 for vegetables. Pearson correlations for continuous variables ranged from r=.50 for juice oz/day to r=.91 for the dairy food group.

Table 10 *Test-Retest Reliability Correlations for FYPQ and Scale Reliability*

Item	Correlation Coefficients	α
Milk cups/day	.57[a]	
Milk frequency [c]	-.06[b]	
Milk type [c]	.96[b]	
Juice type [c]	.91[b]	
Juice oz/day	.50[a]	
FFQ Fruit	.91[b]	
FFQ Vegetables	.93[b]	
FFQ Dairy	.91[a]	

Item	Correlation Coefficients	α
FFQ Protein	.79[b]	
FFQ All Grains	.77[a]	
FFQ Candy	.72[b]	
FFQ Snacks	.66[a]	
FFQ Sweetened beverages	.85[a]	
FFQ Water	.88[b]	
Parental self-efficacy (8 items)	.68[a]	0.79
Parental perception of child preference (5 items)	.78[a]	0.51
Parental practices (4 items)	.75[b]	0.78
Parental role modeling (2 items)	.70[a]	0.73
Food Security (2 items)	.85[a]	0.92

[a]= Pearson's correlation [b]= Spearman Rho correlation

Validation Study

On average parents reported that children consume the five food groups from 1.8 to 3 times daily compared to 1.1 to 3.27 servings reported on the 24HR.

Construct validity between the FFQ and the 24HR was examined using nonparametric statistics. Spearman's rho correlations were r=.29 (NS) for milk , r=.52 for fruit ($p<.001$), r=.57 for vegetables ($p<.001$), r=.85 for protein ($p<.001$).and r=.41 for grains ($p<.05$). The highest correlation coefficient obtained is for protein. Fruit, vegetable and grain correlations are moderate, but significant. The correlation for milk was not significant.

Table 11 ***Medians and Validity Correlations between FFQ and 24HR Pilot Study***

Food Group	24HR Servings/day	P-FFQ Frequency/day	Correlation Coefficients
Protein	0.95 (0.61-1.65)[¥]	1.56 (0.70-2.93)	.85[a]
Vegetables	0.55 (0.09-1.44)[¥]	2.29 (1.14-3.57)	.57[a]
Fruit	2.43 (0.85-3.65)	1.86 (1.29-3.14)	.52[a]
Grain	3.20 (2.37-4.37)[¥]	2.43 (1.71-3.43)	.41[a]
Milk	1.75 (1.00-2.54)	1.29 (0.57-2.14)	.29[a]

[a] Spearman correlations between 24HR and FFQ.
[b] IQR= interquartile range (25^{th} -75^{th} percentiles).
[¥] $p < 0.05$ for significant differences between 24HR and FFQ.

Nomological Validity

Table 12 contains the correlation matrix for the nomological validity of the FYPQ scales for parental self-efficacy, child preference, parental practices, parental role modeling and the fruit and vegetable accessibility and availability index in predicting fruit and vegetable intake as assessed by the 24HR and the FFQ. Significant correlations were obtained for child preference and parental role modeling and fruit and vegetable intake *(See table on next page).*

Table 12 *Correlations of Predictive Variables with Fruit and Vegetables Intake*

	1	2	3	4	5	6	7
1. Parental self-efficacy							
2. Child preference	.24						
3. Parental practices	.23	.40*					
4. Parental role modeling	.50*	.41*	.57*				
5. Fruit & vegetable accessibility & availability index	.63*	.16	.45*	.34			
6. 24HR FV servings	.26	.45*	.27	.40*	.02		
7. FFQ FV frequencies	-.08	.25	.28	.47*	.27	.55*	

* $p < 0.05$

Discussion

Results from the pilot study indicate that the FYPQ tested in a small sample (n=19) of parents of preschool children yielded acceptable test-retest reliability and indicate a high level of internal consistency of the scales. Data analysis to determine the construct validity of the 65-item FFQ against a 24HR yielded acceptable levels of validity and evidence for nomological validity.

The test-retest reliability of the FYPQ ranged from .50 to .93. The FFQ portion had an average r=.80 with a range .50 to .93. Most of the correlations were moderate to high. These correlations were similar and in some cases higher than the mean test-retest correlations reported by others, which include .45 (Bash et al., 1994), .67 (Treiber et al., 1990), .69 (Klohe et al., 2005) and .76 (Metcalf et al., 2003). Only the milk frequency correlation was not significant.

Frequencies per day from the second FFQ were remarkably similar to the first administration, with the exception of grains and parental role modeling, providing evidence for

test-retest reliability indicating that the instrument can produce relatively consistent results over time.

Validity correlations in dietary studies range from .4 to .7 for nutrients. For food groups, these correlations tend to be more variable as daily fluctuations in food intake are more typical in foods than nutrients (Nelson, 1997). This pilot study found correlations between the two instruments of .29 for milk to .85 for protein with an average correlation of .53 for the food groups. The only correlation that was not significant was milk (.29), this could have been due to the small sample size (n=25). An increase in sample size could increase power to detect a significant correlation.

Despite the inevitable limitations of this pilot study, the validity correlations observed (.29 to .85) are similar to other validity studies that analyzed food groups. Klohe and colleagues (2005) reported correlations ranging from .10-.69 in a similar population. Hoelscher and collegues (2003) reported correlations between .32-.68 for 17 food categories. Other studies in adult populations have reported average correlations of .20 (Sauvaget et al., 2002), .47 (Erkkola et al., 2001) and .56 (Flagg et al., 2000). These findings offer support that the FFQ is a valid instrument for the assessment of fruit, vegetable, grain and protein intake when compared to a 24HR.

Internal consistency reliability of the scales were similar to other studies that have used these same scales. Parental self-efficacy yielded a similar alpha to Seth and colleagues (.79 vs. .76). The parental practices (.78) and parental role modeling (.73) scales provided high internal consistency in this pilot and were similar to those observed by Dave and colleagues (2006). The parental perception of child preference scale was moderate (.51). This moderate correlation obtained could be due to the limited sample size used in this pilot study (n=25).

The nomological validity section reported correlations, as the sample size was too small to run ordinary least squares regression. The only significant correlations found between the four constructs and fruit and vegetable intake as measured by the 24HR and the FFQ were between child preference and FV intake on the 24HR (r=.45) and parental role modeling and FV intake on the 24HR (r=.40) and FFQ (r=.47). The literature also has found associations between fruit and vegetable access and availability in older children and actual fruit and vegetable intake (Kratt et al., 2000) and parental self-efficacy and fruit and vegetable intake in preschool children (Evans et al., 2008). Despite the small sample size, evidence supporting the nomological validity of the instrument has been identified for two of the constructs. A larger sample should yield results similar to those found in other studies.

Findings from the Pilot study

The pilot study demonstrated the feasibility of recruitment and administration of the preschool food frequency questionnaire (FFQ) and the 24-hour food recall (24HR). The pilot provided an initial examination of the hypothesized relationships.

A major limitation of the pilot study was the small sample size. This resulted in insufficient power to fully evaluate the relationships among the variables and run the ordinary least squares regression. The small number of responses also increased the skewness and kurtosis, as outliers had more influence on the distribution. The dissertation used a larger sample size to increase power and thus the possibility of finding significant results and establishment of the FYPQ as a valid and reliable instrument was increased.

Results from the proposal presentation and pilot study indicated the use of a more homogenous group. It was therefore recommended by the committee to limit the dissertation study participants to those of low-income and of Hispanic ethnicity. Low-income in this study was defined as 200% above the poverty line.

In the validation study, milk was the only variable that did not present a significant correlation between the two methods of intake. The committee members of this dissertation recommended cognitive interviewing to explore this discrepancy. Twenty mothers were asked what they were thinking when they answered the milk question. The FFQ uses the same question provided by the USDA behavior checklist and is comprised of two items. The first item determines if the child drinks milk daily with response options "always", "sometimes" and "never". This is followed with a second open-ended item that inquires about the amount of milk that the child is offered: "About how many cups of milk does this child drink each day?" In the original FYPQ these items follow the milk group items. The 24HR asks the parent what they gave the child to drink in the last 24 hours.

Most of the mothers interviewed thought the second item referred to the quantity of milk cups or ounces of milk her child drinks in one day. Approximately 30% (six) thought it meant the number of times they give the child milk and would report a number. Two (10%) other mothers thought it meant total dairy. Mothers were asked how the question could be asked differently to get at cups of milk instead of frequencies. Several suggested moving the two items before the frequency questions for dairy items. This would make it easier to understand that quantity was wanted and not frequencies. Other mothers said that, while they liked having these questions first, it would affect the way they answered the questions. Questions were moved to the beginning of the milk section. The mothers reported they liked having these questions first, however it still wouldn't affect the way they answered the questions. They said they would still report frequencies instead of quantity unless they were told beforehand. Moving the items fixed the problem for the mothers that were thinking of total dairy and made it clear that the first question in the FFQ referred to chocolate or flavored milk only and not to plain milk.

Chapter 4: Results

Data collection begun in late January 2009 and continued through March 2009. A total of 135 mothers were interviewed. Eighty-seven (64.4%) mothers returned the second administration of the FYPQ, which was used to examine the test-retest reliability of the survey. Fourteen surveys were excluded from the validation and five from the test-retest reliability study; seven of these did not meet the income eligibility guidelines, five were not of Hispanic ethnicity and two surveys did not include a 24-hour food recall (24HR) or a time two food frequency questionnaire (FFQ). The validation study included 121 participants who responded to both the 24HR and the feeding your preschooler questionnaire (FYPQ). Of the 121 surveys, six cases were removed from the analyses due to more than 10% missing data across variables, and eight cases were removed because they reported extreme intakes for either fruit, vegetables, milk, protein or grains for their age group. For example, if a parent reported that their 3 year old child ate 12 servings of fruit on the 24HR or on the FFQ, that child's data were not included in the analysis. The final sample size for the validation study was 107.

Forty-six participants were recruited from four Head Start programs in Central Texas; 27 from the "Feria para Aprender"; 15 from the Mexican consulate; 14 from the Austin Independent School District Learning Academy at Linder Elementary School and 13 from the Aspire program at the Lucy Read Elementary School; five were collected from friends and acquaintances in Round Rock and two mothers from Posada Esperanza in Austin, Texas. Seventy-seven percent reported Spanish as the main language spoken at home.

Sixty seven percent of these parents enrolled their children in some kind of child care program. The children's ages ranged from 2 to 5 years of age with a mean of 3.8 yrs. More than half of the children were girls (56.1%). Nineteen (17.8%) parents reported ever having been told by a health care provider that their child was overweight, while 12 (11.2%) had been told that their child was underweight. Table 13 summarizes the demographics measures of this study.

Table 13 *Demographic Measures (n=107)*

	Total/Average	%	Min	Max
Child's age	3.8 (±1.05)		2	5
Gender				
Girls	60	56.1		
Boys	47	43.9		
Parent's age	30.8 (±5.45)		21	44
Parent's Gender				
Mothers	98	91.6		
Fathers	8	7.5		
Parent's ethnicity				
Hispanic	107	100		
Parent's marital status				
Married	87	81.3		
Single	14	13.1		
Divorced	4	3.7		
Did not answer	2	1.9		
Parent's education level				
1-6th	15	14.5		
7-9th	19	17.9		
10-12th Grade	15	14.5		
High school graduate/GED	22	20.6		
Some College	33	30.8		
Did not answer	3	2.8		

	Total/Average	%	Min	Max
Parent's employment status				
Full-time	31	29.0		
Part-time	21	19.6		
Unemployed	54	50.5		
Did not answer	1	0.9		
Monthly household income				
$0-999	26	24.3		
$1,000-1,999	42	39.3		
$2,000-2,999	15	14.0		
$3,000-3,999	4	3.7		
$4,000-4,999	4	3.7		
Doesn't know	10	9.4		
Did not answer	6	5.6		
People living in the home	4.22 (±1.02)		2	8
Main language				
Spanish	82	76.6		
English	20	18.7		
Both	4	3.7		
Did not answer	1	0.9		
Food Assistance participation				
WIC	51	47.7		
Other	45	42.1		
Food Security				
Food Insecurity	83	77.6		

TEST-RETEST RELIABILITY

The demographic characteristics of the participants included in the test-retest study (n=82) were similar to the sample reported in the validation study. The main differences found in this sample were child's gender (more than half of the children in this sample were boys 54.8%), parents employment (60% were unemployed) and food assistance participation (48% participated in "other" food assistance programs). Table 14 compares the median intakes of the food groups and Spearman correlations. Medians and Spearman correlations for the psychosocial variables measured by the FYPQ are also included. Data for the FFQ were not normally distributed, except for the dairy food group at Time 1. Spearman correlations were used based on the Shapiro-Wilks normality test, skewness, kurtosis and normality plots. The FYPQ was administered twice within a four day window. Eighty-seven participants completed the survey a second time. One participant was excluded for extreme intake. Four others did not meet either income eligibility or ethnicity guidelines. The data for the reproducibility study were analyzed for the 82 participants who completed both surveys. The median daily intakes of milk, juice, fruit, vegetables, candy, snacks, sweetened beverages and water for the first and second administrations were not significantly different ($p>0.05$) between time 1 and time 2.

Table 14 *Test-Retest Reliability Medians Table and Correlation Coefficients (n=82)*

Item	Time 1 Medians (IQR)	Time 2 Medians (IQR)	Spearman Correlation Coefficient
Food Groups			
FFQ Vegetables	2.71 (1.43-4.57)	2.29 (1.43-4.57)	.84
FFQ Protein	1.52 (1.00-2.00)¥	1.14 (0.86-1.86)	.76
FFQ All Grains	2.29 (1.71-3.14)¥	2.14(1.57-3.14)	.75
FFQ Fruit	2.29 (1.57-3.57)	2.43 (1.43-3.29)	.75

Item	Time 1 Medians (IQR)	Time 2 Medians (IQR)	Spearman Correlation Coefficient
Juice oz/day	8.00 (5.00-10.50)	7.00 (4.00-8.00)	.73
Milk cups/day	2.00 (1.38-3.00)	2.00 (2.00-3.00)	.70
FFQ Snacks	0.57 (0.29-1.00)	0.43 (0.29-1.00)	.70
FFQ Sweetened beverages	0.43 (0.14-0.71)	0.43 (0.14-0.71)	.68
FFQ Dairy	1.29 (0.71-1.86)[¥]	1.00 (0.57-1.86)	.66
FFQ Candy	0.85 (0.57-1.43)	0.86 (0.57-1.14)	.63
FFQ Water	7.00 (4.00-7.00)	7.00 (4.00-7.00)	.53
Psychosocial Constructs			
Food security index	2.00(1.00-3.00)	2.00(0.00-3.00)	.76
Parental perception of child preference	12.00 (9.00-13.00)	12.00 (10.00-14.00)	.71
Parental practices	11.00 (8.00-13.00)	11.00 (8.00-14.00)	.70
Parental self-efficacy	2.00 (1.38-2.38)	1.88 (1.38-2.38)	.69
Parental role modeling	5.00 (4.00-6.00)[¥]	5.00 (4.00-7.00)	.64

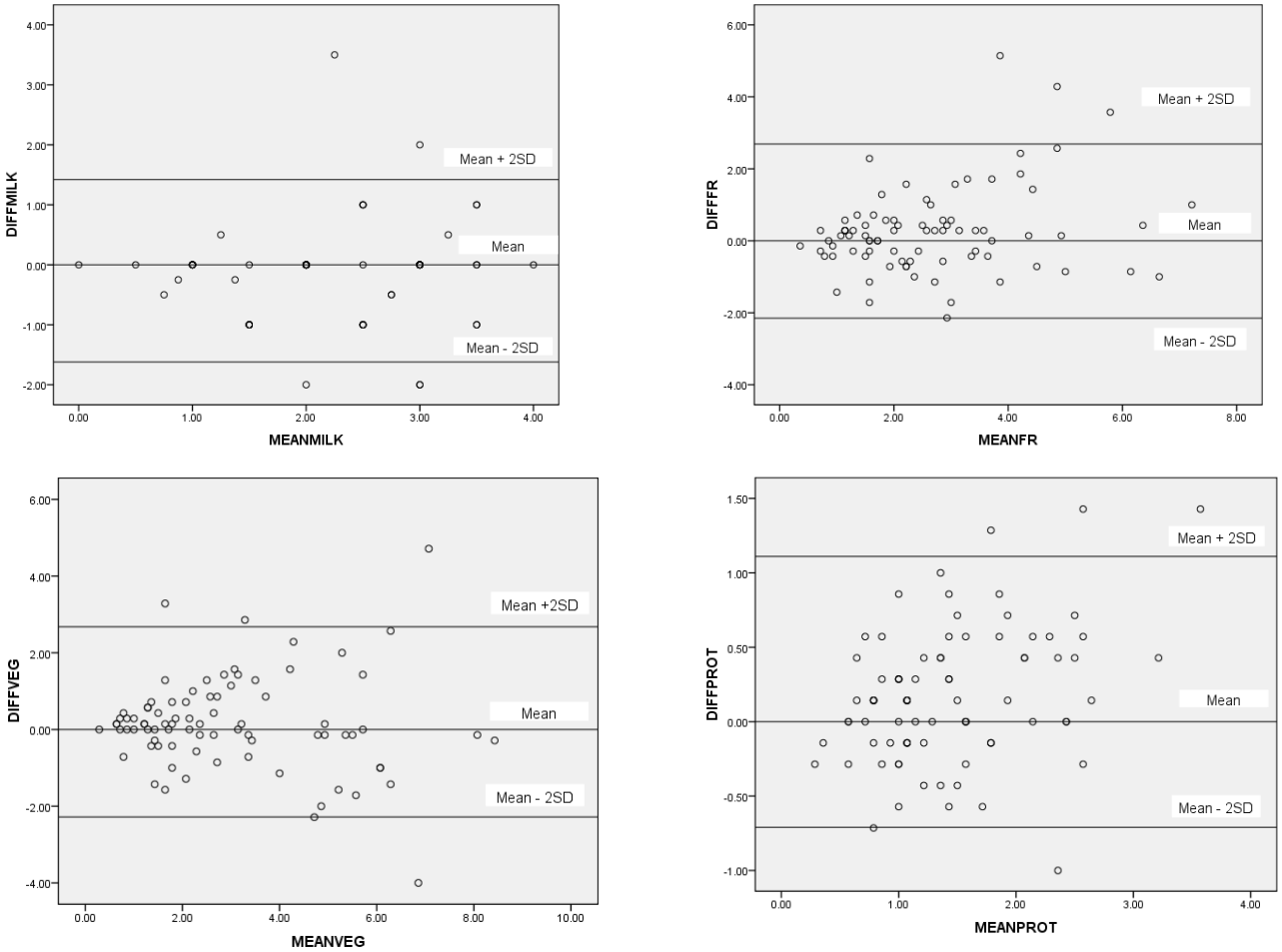
[a] Spearman correlations between Time 1 FFQ and Time 2 FFQ.
[b] IQR= interquartile range (25^{th} -75^{th} percentiles).
[¥] $p < 0.05$ for significant differences between Time 1 FFQ and Time 2 FFQ.

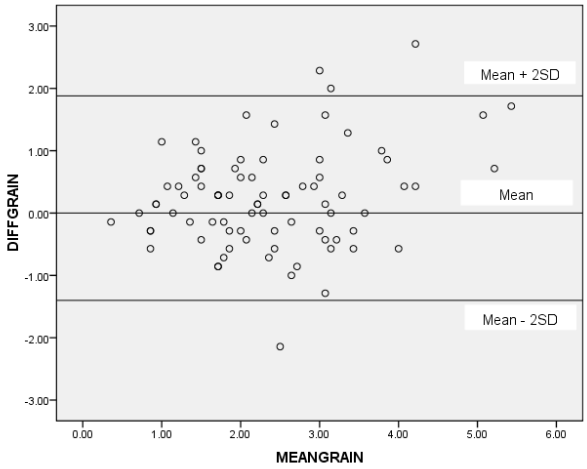
A Bland & Altman analysis demonstrated that the mean difference in food group intakes for milk, fruit, vegetables, protein and grains between the two administrations ranged from -0.10 (SD=0.76; 95% CI -0.27, 0.08) frequencies for milk to 0.29 (SD=1.21; 95% CI 0.02, 0.57) frequencies for fruit. This demonstrates that the first FFQ could estimate milk intake from -1.62 cups below to 1.42 cups above and fruit intake from -2.15 frequencies below to 2.69 frequencies above the second FFQ (Bland & Altman, 1986). This is graphically shown in Bland & Altman plots (Figure 2).

Table 15 *Bland-Altman Analysis Mean Difference and Limits of Agreement*

Food Group	Mean difference (±SD)	Limits of agreement
Milk	-0.10 (±0.76)	-1.62 to 1.42
Fruit	0.29 (±1.22)	-2.44 to 2.73
Vegetables	0.20 (±1.25)	-2.28 to 2.68
Grain	0.23 (±0.82)	-1.40 to 1.88
Protein	0.17 (±0.47)	-0.77 to 1.11

Figure 2 *Bland Altman Plots (Test-Retest Reliability)*





Spearman correlations for the categorical variables ranged from r=.64 for parental role modeling to r=.76 for food security index. Spearman correlations for the non-normally distributed food intake variables ranged from r=.53 for water to r=.84 for vegetables.

Table 16 shows the scale reliability of the scales and indexes of the first administration. The lowest alpha was obtained for food security index (α =.75) and the highest for parental self-efficacy to feed the child fruits and vegetables (α =.81) demonstrating good scale reliability.

Table 16 *Scale Reliability for FYPQ Indices*

Item	α
Parental self-efficacy (8 items)	.81
Parental practices (4 items)	.80
Child preference (5 items)	.78
Parental role modeling (2 items)	.76
Food security (2 items)	.75

VALIDATION STUDY

The average frequencies of intake of the five food groups examined in the FFQ and the 24HR are presented in Table 17. Parents reported that children consume all five food groups. The FFQ overestimated intake for milk and vegetables, and underestimated intake for protein and grains as compared with the 24HR.

Table 17 *Medians and validity correlations between FFQ and 24HR.*

Food Group	24HR Servings/day	FFQ Frequency/day	Correlation Coefficients [a]
Milk	1.45 (0.75- 2.03)[¥]	2.00 (1.50-3.00)	.46
Fruits & Vegetables	3.22 (1.91-4.87)[¥]	4.57 (3.29-7.00)	.29
Fruit	2.04 (0.43-2.97)	2.47 (1.43-3.14)	.22
Vegetables	1.15 (0.37-2.18)[¥]	2.43 (1.29-4.00)	.22
Grain	3.43 (2.22-5.15)[¥]	2.43 (1.71-3.14)	.11
Protein	2.26 (1.18-3.84)[¥]	1.29 (0.86-1.71)	.07

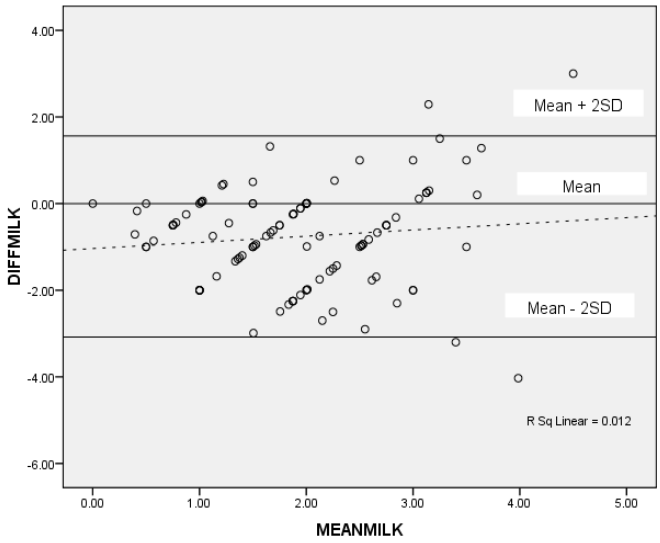
[a] Spearman correlations between 24HR and FFQ.
[b] IQR= interquartile range (25^{th} -75^{th} percentiles).
[¥] $p < 0.05$ for significant differences between 24HR and FFQ.

Construct validity between the FFQ and the 24HR was examined using nonparametric correlations. Spearman's rho correlations were r=.46 for milk (p<.001), r=.22 for fruit (p<.05), r=.22 for vegetables (p<.05), r=.11 for grains (NS) and protein was r=.07 (NS).

In addition to Spearman correlation coefficients used to obtain an association between the two methods, the milk data were explored further with a Bland-Altman analysis as suggested by Cade and colleagues (2001). The mean difference between the two intake measures was -0.76 cups and the limits of agreement were -3.08 cups below to 1.56 cups above the 24HR. Figure 3 presents the Bland -Altman plot for the milk food group. Visual inspection of the plot finds that almost all data points (96.3%) are contained within the limits of agreement. There is no evidence

for a difference between the two methods at lower or higher intakes indicating that the FFQ and the 24HR are measuring milk intake within the same narrow range.

Figure 3 *Bland-Altman Plots and Regression Analysis for the Milk as Measured by the FFQ and the 24HR.*



Cross-classification analysis into quartiles of food group servings per day for the FFQ and the 24HR are illustrated in Table 18. On average, 29% of children were classified in the exact same quartile and 69% in the same or within one quartile of intake for both dietary assessment methods. Gross misclassification, or classification into opposite/extreme quartiles by the two methods, ranged from 2% for milk to 10% for protein.

Table 18 *Proportion of Children Classified in the Same, Within One, or in the Opposite Quartiles for Food Groups per Day by the FFQ and 24HR.*

Food Group	Same quartiles (%)	Same or within one quartile (%)	Opposite quartile (%)
Fruits & Vegetables	38	72	6
Grain	31	69	9
Fruit	29	71	7
Vegetables	26	68	7
Protein	26	55	10
Milk	24	80	2

NOMOLOGICAL VALIDITY

Table 19 presents the mean scores and ± standard deviation for each of the psychosocial predictors and for fruit and vegetable intake as measured by the 24HR and the FFQ.

Table 19 *Mean and Medians Scores ± Standard Deviations for Psychosocial Predictors and F&V Intake.*

Data used in the analysis	Mean ± standard deviation	Medians (IQR)
Food insecurity [a]	1.20 ± 0.40	1.00 (1.00-1.00)
Parental self-efficacy [b]	1.81 ± 0.69	1.86 (1.25-2.38)
Parental perception of child preference [c]	11.34 ± 3.34	11.00 (9.00-14.00)
Parental practices [d]	10.73 ± 3.29	11.00 (8.00-13.00)
Parental role modeling [e]	4.62 ± 2.07	5.00 (4.00-6.00)
Fruit and vegetable access and availability	11.14 ± 2.16	11.00 (10.00-13.00)

Data used in the analysis	Mean ± standard deviation	Medians (IQR)
index [f]		
24HR F&V servings	3.51 ± 2.12	3.22 (2.00-5.01)
FFQ F&V frequencies	5.20 ± 2.51	4.57 (3.29-7.00)

[a] Food insecurity dichotomized 0= food secure, 1= food insecure.
[b] High parental self-efficacy=3. Range: 0 to 3.
[c] Parental perception of child preference the higher the value the greater the preference for F&V Range: 0 to 20.
[d] Parental practices the higher value the more positive practices toward promotion of F&V. Range: 0 to 16.
[e] Parental role modeling the higher the value the more parental role modeling. Range: 0 to 8.
[F] High fruit and vegetable access and availability = 18. Range: 0 to18.

Table 20 contains the correlation matrix for the nomological validation of the FYPQ. Spearman correlations for the scales for parental self-efficacy, child preference, parental practices, parental role modeling and the fruit and vegetable accessibility and availability and food insecurity index are presented. Significant correlations were obtained for parental self-efficacy to buy, prepare, serve, and offer child fruits and vegetables, parental perception of child preference, and parental role modeling and fruit and vegetable intake as measured by the 24HR and the FFQ. Fruit and vegetable intake as measured by the FFQ was also significantly correlated to parental practices regarding fruit and vegetables and the fruit and vegetable access and availability index.

Table 20 *Spearman's Rho Correlations of Predictive Variables with Fruit and Vegetables Intake*

Food Group	1	2	3	4	5	6	7	8
1. Food insecurity								
2. Parental self-efficacy	.28							
3. Parental perception of child preference	.05	.49						
4. Parental practices	.11	.62	.51					
5. Parental role modeling	.06	.53	.41	.51				
6. Fruit and vegetable accessibility & availability index	-.18	-.41	-.29	-.25	-.19			
7. 24HR F&V servings	.06	.20	.27	.09	.19	.14		
8. FFQ F&V frequency	-.19	.26	.39	.33	.40	-.21	.29	

Table 21 shows the results of two regression analyses examining the influences of psychosocial predictors (parental role modeling, parent practices, parental self-efficacy and parental perceptions of child preference), food insecurity and fruit and vegetable access and availability on fruit and vegetable intake measured first on the FFQ and second on the 24HR. The first regression model (R^2= 0.28, p<.001) explained 28% of the variance in fruit and vegetable intake, parental role modeling and food insecurity were the only significant predictors in the model. As parental role modeling for fruits and vegetables increases and food insecurity decreases, preschool children's fruit and vegetable intake will increase. In the second regression analysis predicting fruit and vegetable intake as measured by the 24HR recall the model was able to explain 11% of the variance (R^2= 0.11, p<.05). Parental role modeling and parental perception of child preference were the only significant predictors in this model.

Table 21 *Parameter Estimates for Predictors of Fruit and Vegetable Intake as Measured by the 24HR and the FFQ*

Predictor	Zero-order correlations	Regression weight (ß)	Model R^2
FFQ F&V Frequencies			.28
Parental role modeling	.41	.39*	
Food insecurity	-.08	.18*	
Parental self-efficacy	.21	NS	
Parental perception of child preference	.31	NS	
Parental practices	.24	NS	
Fruit and vegetable access and availability index	-.15	NS	
24HR F&V Servings			.11
Parental perception of child preference	.21	.28*	
Parental role modeling	.21	.20*	
Food security	-.11	NS	
Parental self-efficacy	.06	NS	
Parental practices	.13	NS	
Fruit and vegetable access and availability index	-.11	NS	

$p \leq .05$

Chapter 5: *Discussion*

The Feeding Your Preschooler Questionnaire (FYPQ) tested in this dissertation among a group of low-income Hispanic parents of preschool children showed acceptable test-retest reliability. The 65-item food frequency questionnaire (FFQ) component of the FYPQ had excellent reliability with an average r=0.71 and a range from 0.50 to 0.84. Most of the correlations were moderate to high. These correlations were higher than those expected from earlier studies (.40 to .60) for food group intakes (Willett, 1998). They were similar and in some cases higher than the mean test-retest correlations reported for nutrients and food groups by others for similar populations, including .45 (Bash et al., 1994), .67 (Treiber et al., 1990), .69 (Klohe et al., 2005) and .76 (Metcalf et al., 2003). The results were also similar to those observed by Eck and colleagues (1991) in their test-retest reliability study of a 7-day FFQ. The average reported correlation was .63 for a seven day period and .91 for a few hours. Test-retest reliability correlations in the pilot study demonstrated similar correlations (.50 to .93) with an average of .77 for the same time frame as the dissertation, but in a slightly different demographic population from those reported in earlier studies.

The higher values seen in this study may be due to the shorter time span between time 1 and time 2 (2 to 4 days) compared to others (13 days to 3 months), as test-retest correlations diminish with time (Willett, 1998). Longer time intervals in this population may be inappropriate for several reasons. For example, preschool children's food intake habits may change rapidly as they go through different developmental stages, and the changes in food choices may be mistaken for poor performance of the instrument. A seven day time period is easier for parents and caretakers to remember what the child ate and decreases memory retrieval errors compared to a longer time period. Additionally this FFQ measures intake in the past week and a greater

time span would not have permitted overlap of the days reported in the FFQ and the 24HR and would have influenced the results obtained.

Frequencies per day from the second FFQ administration were remarkably similar to the first administration with exception of dairy (0.14 frequencies smaller at time 2), protein (0.17 frequencies lower at time 2) and grains (0.23 frequencies smaller at time 2). With the exception of these three food groups, the FFQ did not show significant over or underestimation of food groups, providing evidence for test-retest reliability and indicating that the instrument can produce relatively consistent results over time.

Test-retest reliability of the psychosocial variables (parental self-efficacy, parental role modeling, parental practices and parental perception of child preference) ranged from r=.63 to .76 with an average of .70. These are slightly lower than the test-retest correlations reported in the pilot study (.68 to .85 with an average of .75), but are within acceptable range. Internal consistency reliabilities of the scales were similar for the same scales used in other studies. Parental self-efficacy yielded a lower alpha to that of Seth and colleagues (.70 vs. .86). The parental practices (.70) provided acceptable internal consistency reliability. Parental perception of child preference (.69) and parental role modeling (.63) scales provided showed low but acceptable internal consistency (DeVellis, 2003). These results provide evidence for test-retest reliability of the FYPQ and the acceptance of hypothesis 1.

Concurrent validity correlations in dietary studies have ranged from .4 to .7 for nutrients (Willett, 1998). For food groups, these correlations tend to be more variable as daily fluctuations in food intake are more typical in foods than in nutrients (Nelson, 1997). This study found significant correlations for three out of the five food groups evaluated. Spearman correlations between the two methods of food intake assessment were .46 for milk, .22 for fruit, .22 for vegetables and .29 for fruits and vegetables when grouped together. Correlations for protein and

grains were not significant. In contrast, the pilot study found significant correlations for four out of the five food groups; the correlations for fruit, vegetables, protein and grains were .52, .57, .85 and .41 respectively. Milk was the only food that did not have a significant correlation in the pilot study, but had a moderate correlation in the larger study.

The smaller correlations seen in the dissertation sample for grain and protein could have been due to the small number of food items contained in the FFQ food lists for these food groups. The food group list for proteins included only the protein sources contained in the WIC food package and those that were a significant source of iron. The grain category was not comprised of an extensive list of grains and did not include culturally sensitive items such as tortillas, rice, "fideo", and other pastas. When the FFQ was developed, the research objective was to identify iron-rich grain items consumed by WIC participants, specifically cereals, iron rich bread and common items used as snacks in preschool children. Unfortunately the item list was not comprehensive and did not include culturally sensitive items. One suggestion for future research would be to develop a more comprehensive list of grain items generally eaten by low-income Hispanic toddlers. The 24HR is an open-ended questionnaire and has the possibility of including any array of items contained in the families' diets and therefore can sample a greater number of food items than those contained in the FFQ list. Given the difference in sampling diversity and quantity specifications between one survey and the other (servings versus frequencies), a strong correlation between the two instruments would not be expected.

The low correlation observed for fruits and vegetables is probably due to average consumption of the food over time versus average daily consumption. This study compared a single day's diet to a one week FFQ. A single day's diet is not a true measure of an individual's diet nor does it give a snapshot of the variety consumed (Kroes, 2002). The FFQ might be a better instrument to use if one wishes to obtain a snap shot of diet intake over time. It seems that

the sample in this study had a lower intake of fruits and vegetables on the day of the recall. According to the 24HR, 14% of children did not eat a single fruit and 10% did not eat a single vegetable on the day of the recall; in addition 26% of the sample reported fruit intake of less than one serving and 46% reported less than one serving of vegetables. In contrast, average daily consumption of fruit and vegetables as measured by the FFQ of less than one serving was reported only among 11% of the sample participants.

Another aspect that could have influenced the low correlation coefficients observed was the fact that an assumption was made to compare frequencies to servings. Parental report of a frequency on the FFQ was assumed to be equal to one serving on the 24HR. Having different measures on the two instruments would directly influence the correlation coefficient.

Despite the inevitable limitations of this study the validity correlations observed (.20 to .46) are similar to other concurrent validity studies that analyzed food groups and used a semi-quantitative FFQ. Klohe and colleagues (2005) reported correlations ranging from .10-.69 in a similar population. Hoelscher and collegues (2003) reported correlations between .32-.68 for 17 food categories. Other studies in adult populations have reported average correlations of .20 (Sauvaget et al., 2002), .47 (Erkkola et al., 2001) and .56 (Flagg et al. 2000). These findings offer partial support to hypothesis 2 that the FFQ is a valid instrument for the assessment of milk, fruit, vegetable, and fruit and vegetable intake when compared to a 24HR.

Further examination of the data using a Bland-Altman analysis continued to provide evidence that the FFQ is suitable for assessing milk intake. This method is preferable to the use of the correlation coefficient which looks at the strength of association between two variables and not the agreement between them. The Bland-Altman method can determine if there is a systematic difference between two questionnaires, and to what extent the two administrations agree. It also provides a way to determine if the difference between the methods is constant or if

the difference varies at lower or higher intakes (Bland-Altman, 1986). Milk was the only item in this study that was quantified in both surveys (24HR and FFQ). Daily milk intake was 1.55 and 2.34 cups for the 24HR and the FFQ respectively. The mean difference in milk intake (bias) between the two methods was -0.76 cups, demonstrating that the FFQ overestimates milk intake in comparison with the 24HR. The 95% limits of agreement demonstrated that the FFQ assessed milk intake from -3.08 cups below to 1.56 cups above the 24HR (Bland & Altman, 1986). The majority of the data points are contained within the set agreement and are small enough to indicate confidence that the FFQ can be used to assess milk intake with about the same accuracy as the 24HR. In addition, a regression analysis demonstrates no linear association between the difference of the two methods and their average. Therefore the difference between the methods does not vary at higher or lower milk intakes.

Cross-classification analysis into quartiles of food group servings per day for both methods found that the mean percent of subjects correctly classified into the same quartile was 29%, and 69% were correctly classified in the same or within one quartile of intake for both dietary assessment methods and 2-10% were misclassified. These results are similar to those reported for preschool children where 35% were classified in to the same quartile and 76% within one quartile, and gross misclassification ranged from 0 to 8% (Klohe, 2005). Validation studies in adults have reported 29-33% placement into same quartile and average gross misclassification of 6-7% (Torheim et al., 200; Parr et al., 2002). The results from the cross-classification study indicate that the FFQ can rank subjects according to dietary intake similarly to a single 24HR for all five food groups.

Given the validity correlations obtained and the results from the cross-classification analysis, the FFQ compared to a 24HR underestimated intake for two food groups and overestimated for two out of five food groups. Two other studies conducted in preschool children

examined validity of a semi-quantitative FFQ compared to diet records or an average of three 24HR. One study found that a FFQ underestimated intake for four out of nine food groups and had no significant overestimates (Klohe et al., 2005); the other study reported both over and underestimation (Marshall et al., 2003). In adults, FFQs tend to overestimate foods or food groups as compared to 24HRs (Subar, Thompson, Kipnis, Midthune, Hurwitz, McNutt, McIntosh, & Rosenfeld, 2001; Bohlscheid-Thomas, Hoting, Boeing, & Wahrendorf, 1997). Given the results obtained in this study the concurrent validity hypothesis that children's usual eating habits as measured by the FFQ is significantly correlated with eating behavior as measured by a 24-hour dietary recall, is partially sustained. The two measures were significantly correlated for milk, fruit and vegetable intake, and the FFQ was able to correctly rank food intakes for all five food groups in low-income Hispanic children.

For the nomological validation of the FFQ, a set of psychosocial predictors, food insecurity, fruit and vegetable access and availability were used to predict fruit and vegetable intake on the FFQ. The set of items selected to represent the nomological net had been identified, either separately or in some combination, by the literature to be associated with fruit and vegetable intake in older children (Neumark-Sztainer et al., 2003; Havas et al., 1998; Resnicow et al., 1997; Domel et al., 1996). To my knowledge this is the first time this unique set of variables has been put into a regression model together. Hypothesis 3 stated that the physical and social environment and personal factors would be independently significantly related to child's FFQ fruit and vegetables intake, demonstrating nomological validity. This set of predictors produced an overall significant model (R^2= 0.28, p<.001) and two significant beta weights, for parental role modeling (ß=0.41) and food insecurity (ß=0.18), and was able to explain 28% of the variance in fruit and vegetable intake, demonstrating the nomological validity of the FFQ. In other studies, child food preference (Neumark-Sztainer et al., 2003; Resnicow et

al., 1997; Domel et al., 1996) has been found to be the single most important predictor for fruit and vegetable intake. Others have found parental role modeling and more specifically teacher modeling (Savage et al., 2007) and parent self-efficacy (Evans et al., 2008) to be important in preschool children. The literature also has found associations between fruit and vegetable access and availability in older children and actual fruit and vegetable intake (Dave, 2007; Kratt et al., 2000).

Hypothesis 4 postulated that fruit and vegetable intake as measured by the 24HR and the FFQ would be equally predicted by the psychosocial determinants of eating behavior. Both were able to predict fruit and vegetable intake. However the model using the fruit and vegetable intake as measured by the 24HR provided significant beta weights for parental perception of child preference and parental role modeling. In contrast the model that used fruit and vegetable intake as reported by the FFQ as the outcome variable provided significant beta weights for parental role modeling and food insecurity. This model was able to explain a greater percent of the variance in fruit and vegetable intake 28% compared to 11%. Perhaps the FFQ in this case is a better measure of true fruit and vegetable intake than the 24HR. However, the results obtained by the 24HR could have been influenced by the fact that only one replicate was used, and it could be argued that a single replicate is not a true measure of intake.

LIMITATIONS

The FFQ instrument is a non-quantitative FFQ. Therefore assumptions must be made in order to compare frequency counts to serving sizes estimated in the 24HR. However, it is possible to assume that each frequency count represents a serving size as defined by the USDA food guide pyramid. The FFQ was not meant to be an extensive FFQ and does not include all foods contained in the food guide pyramid nor does it include all food guide pyramid food groups. The FFQ estimates a 7-day food intake period which doesn't allow observation of

changes in food intake due to seasonality. Additionally, it may or may not reflect changes observed through developmental periods such as food fads or picky eating.

Another limitation is the use of the 24HR as the comparison standard. As discussed previously there is no gold standard in dietary intake measures, just better performing instruments. The use of a single day diet recall for validation may also be a limitation; random within person error in the measurement of one or both variables being compared tends to reduce correlation coefficients toward zero (Willet, 1998). In this case random within person error can attenuate the correlation coefficients observed. Correcting the observed correlation for this attenuation may provide a value similar to that obtained by a greater number of replicates. In order to correct for this within person error a minimum of two 24HR would have been necessary. However, obtaining a greater number of recalls was not feasible due to the limited resources for the study, incentives and education level of some of the participants.

Relying on parents and caregivers to recall all foods consumed by the child for a particular time period, whether or not they have been with the child at all meals, makes it difficult to obtain a good report of the child's actual diet. Sixty- seven percent of the parents interviewed in the study reported spending time away from their children on a daily basis for at least one meal. Additionally, both the 24HR and the 7-day FFQ rely on parental memory. Low-income parents may be worried about other things that might be considered more important than what their child actually ate, such as providing shelter or paying debts. Pleasing and agreeableness is part of Hispanic culture (Rodriguez & Church, 2003; Marin & Marin, 1991), and social desirability plays a large role in how parents respond to questions especially those related to their children's upbringing (González & Alcañiz, 2006). This may have biased the findings.

The short period between time 1 and time 2 in the test-retest reliability study could falsely increase the correlations due to memory recall of responses from the first administration.

However, since the aim is to capture the same food intake, the allotted time period of 2-4 days allows for overlap in the food days recalled. Furthermore, getting questionnaires answered a second time in a low-literacy population poses its own limitations. We do not know, for example, if the survey was completed by the caretaker or if it was completed during the specified time frame. Finally, the generalizability of these findings is limited to low- income Hispanic (primarily) mothers.

IMPLICATIONS FOR HEALTH EDUCATION

This study provided evidence for the use of an alternative instrument to measure what preschool children are eating and provides insight into a set of psychosocial and environmental influences that may impact what and how a child eats. Most FFQ only look at what the child is eating and tend to ignore the impact of psychosocial and environmental determinants of eating behavior. A better instrument should be one that observes and encompasses not only what the child ate but one that is able to identify why this particular set of food items is being given to the child. Instruments like the FYPQ allow health practitioners to provide better counseling to the child's caretaker on dietary habits; which are extremely important to health.

Early detection of poor dietary habits in children and their correction may prevent the onset of overweight and obesity at these young ages or even later in life. Children between the ages of 2 and 5 should be eating anywhere from 1000 to 1600 Kcal. This would translate to eating 2 to 3 cups of the milk or dairy group, 1 to 2 cups each from the fruit and the vegetable group, 3 to 5 ounces or servings of the grains group and 2 to 5 ounces of protein (USDA, 2007). Children in this study on the day of recall reported eating 1.91 cups of the dairy group with 1.54 cups in the form of milk, 2.02 servings of the fruit group, 1.44 servings of the vegetable group, 1.39 ounces of protein and 3.73 servings/ounces of the grain group. Fruit and vegetables in this

study reported a serving of fruit as 1 medium piece of fruit or ½ cup of fruit and a serving of vegetables as ½ cup of chopped raw or cooked vegetables or a cup of leafy vegetables. In cup-equivalents children were eating approximately 0.75 cups of vegetables and 1.01 cups of fruit which is well below the recommended amounts for preschoolers. The inadequate consumption reported of milk, fruit, vegetables and protein suggest that dietetics professionals must continue to emphasize the importance of these foods. Food assistance programs that offer nutrition education and counseling, such as WIC, should continue to stress the importance of eating age appropriate amounts and a more varied diet. In addition, counseling should help parents overcome barriers and provide skills and opportunities to practice strategies to enhance healthy eating.

Furthermore, the finding of the association between parental role modeling and fruit and vegetable intake suggests that parents need to model positive dietary behaviors to their children, especially if they want their children to behave in a certain way. Nutrition education at WIC and other food assistance programs should also stress the importance of observational learning, including role modeling as a strategy to increase positive eating behaviors. Practicing positive behaviors, describing how to perform a behavior at the clinic or providing opportunities for discussion and role model stories of the behavior can also be useful. Key goals including increasing parental skills, reducing barriers and increasing self-efficacy to perform the targeted behavior should be stressed in counseling and group nutrition education.

Another important finding implicates the importance of food security and fruit and vegetable intake. Given the obesity increase in the last 20 years in the United States, it seems that a diet high in fruit and vegetables provide an alternative approach to weight maintenance and to help reduce overweight. Food assistance and nutrition education programs such as WIC need to continue to counsel on the importance of a varied diet, with the inclusion of all food groups in

correct amounts for these children. In addition it is important to continue to increase the benefits of the food packages they offer in an effort to offset the cost of healthy eating, especially for the consumption of fruits and vegetables, making parents feel more food secure, so that they can purchase and offer better overall nutrition choices to their families.

CONCLUSIONS

The FFQ portion of the FYPQ instrument is a relatively good measure of dietary quality (not quantity) and can be used to measure milk and fruit and vegetable intake. The instrument should be modified to make it semi-quantitative and to include more comprehensive grain and protein food lists. Furthermore, the instrument should include more culturally sensitive food items, especially if it is to be used in a WIC setting where 72% of the population is of Hispanic origin. Because of the limited education of the low-income Hispanic population, it is important that the survey be shorter and only include some of the psychosocial determinants of health behavior in an effort to make it more practical, useful and easily administered to a limited education audience. In this study, slightly fewer than half (46.9%) of the participants had less than a high school education, and14.5% reported less than 6^{th} grade education level. This impacts the reading level and attention span required to answer a survey of this magnitude. Although the FFQ was developed using extensive field testing in the WIC population, I strongly recommend using a shorter version and providing the modifications to the survey as described earlier.

FUTURE RESEARCH

Future research should continue the validation of the FFQ including an extended grain and protein food list and culture specific foods and include portion sizes of food group categories to aid in the validation and, more importantly the quantification of the child's actual diet. The questionnaire could then be validated in different income and ethnic populations. Future research

could also examine the construct validity of the parental self-efficacy scale for preschool fruit and vegetable intake. More determinant studies could be conducted on parental role modeling and child preference as moderated by age. Another direction might be to study other specific parental practices that influence fruit and vegetable behavior in preschool children and the influence of maternal depressive symptoms on feeding preschool children. Finally, one could explore the differences in fruit and vegetable intake among WIC and non-WIC participants, and among different levels of acculturation and parental education.

Appendix A: Consent Forms

CONSENT FORM

Project Title: Reproducibility and Validity of the "Feeding Your Preschooler" Questionnaire For Ethnically Diverse Populations
IRB PROTOCOL # 2007-05-0086
Principal Investigator: Nell Gottlieb, Ph.D., University of Texas at Austin, *Health Promotion Research Group*

INTRODUCTION
You are invited to take part in a research study. "Research" is a way to find out more about something. This study is conducted by Nell Gottlieb of the University of Texas.

You can choose whether or not to take part in this study. This form should tell you all you need to know about this research so that you can make up your mind to say yes or no. You should make a decision you are comfortable with. If you have any questions, just ask. Whether or not you decide to participate in this study will not affect your current or future benefits/relationship with Head Start.

GOAL OF THE STUDY
The purpose of this study is to find out if a survey we developed measures what and how preschool aged children are eating. We will use the results from the study to make sure our instrument measures what and how your child eats, so that it can be used in the future to measure what and how toddlers eat.

WHAT WILL YOU DO?
If you choose to be in this study, we will ask you to:
• Fill out a paper survey about what and how your child eats that will take you about 15 minutes.
• Approximately 2-3 days letter I will ask you to fill out the survey once again and give it to Julie Lichtner by Friday February 27th, 2009.

WHAT ARE THE RISKS?
• There is very little risk in taking part in the study.
• Your WIC clinic may know that you are taking part in the study.
• You may feel uneasy talking about what your child ate yesterday or about your toddler feeding practices.
• It is possible that other people might hear your answers.

WHAT ARE THE BENEFITS?
• There are no direct benefits to you.
• Your answers may help develop a survey to measure what and how preschool children eat.

MONEY MATTERS
• At this time we can not offer you any monetary compensation for your time or participation in this study.
• You will receive a kid's physical activity video and some nutrition tips for your child for filling out the survey.

PRIVACY AND CONFIDENTIALITY:
We will keep your identity confidential. The results of the study may be written up for scientific use or talked about at meetings. No information will be used that would reveal who you are. However we can not guarantee that other people in the class will do the same.

The information we get through your taking part in this study may be looked at by:
• University of Texas at Austin ethics board
• Researchers involved in the study.

CONTACTS AND QUESTIONS:
If you have any questions about the study please ask now.
If you have questions later or want more information, contact the Principal Investigator, Nell Gottlieb,Ph.D. at 1-655-471-4490 (toll free) or Karol Kaye Harris or Jennifer J. Loyo at 1-655-471-4490 (toll free).
If you have questions about your rights as a research participant, please contact: Clarke A. Burnham, Ph.D. Chair, The University of Texas at Austin Institutional Review Board for the Protection of Human Subjects at 1-512-232-4383.

You will be given a copy of this information to keep for your records.

Statement of Consent:

I have read the above information and have enough information to make a decision about participating in this study. I consent to participate in the study.

Signature:_____ Date: _____

_____ Date: _____
Signature of Person Obtaining Consent

Signature of Investigator:_____ Date: _____

FORMA DE CONSENTIMIENTO

Título del proyecto: Reproducibilidad y validez del cuestionario para poblaciones étnicas diversas "Alimentando a su preescolar".
PROTOCOLO 2007-05-0086
Investigador Principal: Nell Gottlieb, Ph.D., Universidad de Texas en Austin, *Grupo de Investigación Promoción de la Salud*

INTRODUCCION

Esta usted invitado a participar en un estudio de Investigación. "Investigación" es una manera de descubrir mas acerca de algo. Este estudio es conducido por la Dra. Nell Gottlieb de la Universidad de Texas.

Usted puede elegir si quiere o no participar en este estudio. Esta forma deberá decirle todo lo que necesita saber acerca del estudio, para que así pueda decidir si quiere participar o no. Debe tomar una decisión con la que este cómoda. Si usted tiene alguna pregunta, hágala. Si decide participar o no en este estudio no afectará su relación o sus beneficios en WIC de Williamson Co.

META DEL ESTUDIO

El propósito de este estudio es descubrir si el cuestionario que creamos mide que y como comen los niños en edad preescolar. Los resultados obtenidos del estudio nos ayudaran a conocer si nuestro cuestionario mide que y como come su niño, para que pueda ser utilizado en el futuro para medir que y como comen los niños preescolares.

¿QUE HARA USTED?

Si decide participar en el estudio, se le pedirá lo siguiente:
• Participar en una entrevista de 30 minutos, donde le haremos preguntas acerca de lo que comió ayer su hijo(a).
• Contestar un cuestionario acerca de que y como come su hijo(a) que le tomará aproximadamente 15 minutos.
• En un tiempo aproximado de 2 o 3 días le pediré que conteste el cuestionario nuevamente y que me lo envíe por correo usando el sobre que le proporcione con el porte pagado y mi dirección.

¿CUÁLES SON LOS RIESGOS?

• Hay muy poco riesgo asociado con la participación en este estudio.
• La escuela preescolar a la que atiende su niño(a) podrá saber que esta participando en el estudio.
• Puede que se sienta incomoda al hablar acerca de lo que comió su hijo(a) el día anterior o acerca de las prácticas de alimentación de su preescolar.
• Es posible también que otras personas oigan sus respuestas.

¿CUÁLES SON LOS BENEFICIOS?

• No existe ningún beneficio directo hacia usted.
• Sus respuestas podrán ayudarnos a desarrollar un cuestionario en el cual se mide que y como comen los niños preescolares.

COMPENSACION

• Por el momento no podemos ofrecerle ninguna compensación monetaria por su participación en este estudio.

• Usted recibirá un video de actividad física para niños y unos consejos de nutrición para su niño(a) después de haber contestado el cuestionario.

PRIVACIA Y CONFIDENCIALIDAD:
Mantendremos su identidad confidencial. Los resultados del estudio se podrán preparar para publicación científica o hablar de ellos en reuniones. No se utilizará ninguna información que pueda revelar su identidad. Sin embargo, no podemos garantizar que otras personas en el salón de clases hagan lo mismo.

Los expedientes y las encuestas que obtengamos de su participación en el estudio podrán ser mirados por:
• El comité de ética de la Universidad de Texas en Austin
• Los Investigadores implicados en el estudio.

CONTACTOS Y PREGUNTAS:
Si usted tiene alguna pregunta acerca del estudio por favor hágala ahora.
Si usted llega a tener preguntas más adelante o desea más información, contacte al investigador principal, Nell Gottlieb, PH.D. al 1-655-471-4490 (peaje libre) o con Karol Kaye Harris o Jennifer J. Loyo al 1-
655-471-4490 (peaje libre).
Si usted tiene alguna pregunta sobre sus derechos como participante de la investigación, por favor contacte a: Clarke A. Burnham, PH.D. Chair, del Comité Examinador Institucional para la Protección de Sujetos Humanos de la Universidad de Texas en Austin, al 1-512-232-4383.
.

Le darán una copia de esta información para sus expedientes.

Declaración del consentimiento:
He leído la información anterior y tengo la suficiente información para tomar una decisión sobre participar en este estudio. Acepto participar en el estudio.

Firma:_____ Fecha: _____

_____ Fecha: _____
Firma de la persona que obtiene el consentimiento

Firma del Investigador:_____Fecha: _____

Appendix B: Feeding Your Preschooler Questionnaire

FEEDING YOUR PRESCHOOLER QUESTIONNAIRE:
A SURVEY TO ASSESS FOOD INTAKE PATTERNS AND FOOD RELATED BEHAVIORS AMONG PRESCHOOLERS

A study by the University of Texas at Austin
Public Health Promotion Research and
Program Development Group

Instructions:

Thank you for taking part in this research study about what and how children eat. Today we will be conducting a personal interview about what your child ate yesterday and some of your child's usual eating habits. We want to know what you really think and do so please answer as honestly as you can. All of the answers you give will be kept private and will be combined with the answers from other people. Your name will not be connected to any of the information we collect.

Today's interview will last about 15 minutes; at the end of the interview I will hand you a short 10 minute survey regarding your toddler's feeding practices. Two to four days from now I will ask you to fill out the survey a second time. After you complete the survey you will be handed a children's physical activity video to thank you for your time.

Please answer the rest of the questions based on your child between the ages of 2 and 5. We want to know what you really think and do, so please answer as honestly as you can. Again, you don't have to answer any question you don't want to. Please fill in the bubble that best describes your answer.

CH1. **How old is your oldest child between the ages of 2 and 5? _____**

CH1a. **Is this child a boy or a girl?**

○[1] Boy ○ [0] Girl

CH2. **What is your relationship to the child?**

○[1] Mother ○[2] Father

○[3] Foster Mother ○[4] Foster Father

○[5] Step mother ○[6] Step father

○[7] Grandmother ○[8] Grandfather

○[9] Aunt ○[10] Uncle

○[11] Sister ○[12] Brother

○[13] Other: _____

BMI. **Have you ever been told by doctor, nurse, or someone at WIC that this child is overweight or underweight?**

○[1] Yes, overweight

○[2] Yes, underweight

○[0] No

MULTI-STEP 24 HOUR FOOD RECALL (In person interview)

1. ID #:	2. Date:	3. Interviewers Initials:

4. Nutritional Supplements:

○[1] Yes ○[0] No

If yes, list type:

5. On average how much physical activity does your child get a day?

○[0] Less than 30 minutes ○[2] More than 60 minutes

○[1] 30 to 60 minutes

MEAL TYPE

Morning = 1 Afternoon= 4
Midmorning = 2 Evening =5
Noon = 3 Late Evening = 6

SERVING ABBREVIATIONS

Tbsp = tablespoon c = cup
tsp = teaspoon lb = pound
oz =ounce sl =slice
fl oz = fluid ounce

TO BE CODED BY STAFF		6. What did your child eat and drink in the last 24 hours?			
Food ID Number	**Amount Code**	**Food Items and Descriptions**	**Amount eaten**	**Meal type/ time**	**Where?**

Comments:

Please read the items carefully and fill in the bubble that best fits the answer that is true for your child.

USDA7a. **Does he/she drink milk daily?**

○[2] Always ○[1] Sometimes ○[0] Never

USDA7b. *If yes*, **About how many <u>cups</u> of milk does he/she usually drink each day?** □____

USDA7c. **What kind of milk does he/she usually drink?**

○[0] Skim/Fat Free ○1% / Low-fat[1] ○[2] 2% / Reduced-fat ○[3] Whole

○[4] Soy ○[5] Formula ○[6] Breast milk

Next, we would like to know about how often this child ate certain foods in the past week. We want to learn about what your child actually ate, not what you think he or she should eat.

Please read the items carefully and fill in the bubble that best fits the number of times your child ate each food. Answer as best you can remember.

The first group of foods is milk products. How many times in the past week did your child have:

		0	1	2	3	4	5	6	7+
DA1	**Chocolate or other sweetened milk, hot or cold**	○0	○1	○2	○3	○4	○5	○6	○7
DA2	**Cheese, plain, on a sandwich, or cottage cheese**	○0	○1	○2	○3	○4	○5	○6	○7
DA3	**Sweetened yogurt**	○0	○1	○2	○3	○4	○5	○6	○7
DA4	**Ice cream** (cone, sandwich, shake, sundae)	○0	○1	○2	○3	○4	○5	○6	○7
DA5	**Pudding, custard or flan**	○0	○1	○2	○3	○4	○5	○6	○7

The next group of foods is fruit. How many times in the past week did your child eat:

		0	1	2	3	4	5	6	7+
FR1	**Apples, applesauce, or pears**	○0	○1	○2	○3	○4	○5	○6	○7
FR2	**Bananas and plantains**	○0	○1	○2	○3	○4	○5	○6	○7
FR3	**Cantaloupe**	○0	○1	○2	○3	○4	○5	○6	○7
FR4	**Watermelon**	○0	○1	○2	○3	○4	○5	○6	○7
FR5	**Grapes**	○0	○1	○2	○3	○4	○5	○6	○7
FR6	**Oranges** (e.g., clementines, tangerines, mandarins, navels)	○0	○1	○2	○3	○4	○5	○6	○7
FR7	**Peaches or apricots**	○0	○1	○2	○3	○4	○5	○6	○7
FR8	**Pineapple**	○0	○1	○2	○3	○4	○5	○6	○7
FR9	**Mango**	○0	○1	○2	○3	○4	○5	○6	○7
FR10	**Kiwi**	○0	○1	○2	○3	○4	○5	○6	○7
FR11	**Papaya**	○0	○1	○2	○3	○4	○5	○6	○7
FR12	**Lemons or limes**	○0	○1	○2	○3	○4	○5	○6	○7
FR13	**Berries**	○0	○1	○2	○3	○4	○5	○6	○7
FR14	**Dried fruit, raisins or prunes**	○0	○1	○2	○3	○4	○5	○6	○7

F15. **How often do you add sugar, honey or syrup to this child's fruit?**

○0 Never ○1 Rarely ○2 Sometimes ○3 Often ○4 Always

The next group of foods is vegetables. How many times in the past week did your child eat:

		0	1	2	3	4	5	6	7+
VE1	Broccoli	○0	○1	○2	○3	○4	○5	○6	○7
VE2	Carrots	○0	○1	○2	○3	○4	○5	○6	○7
VE3	Cauliflower	○0	○1	○2	○3	○4	○5	○6	○7
VE4	Green beans	○0	○1	○2	○3	○4	○5	○6	○7
VE5	Cabbage or coleslaw	○0	○1	○2	○3	○4	○5	○6	○7
VE6	Peppers green, red, or hot	○0	○1	○2	○3	○4	○5	○6	○7
VE7	Zucchini or other squash	○0	○1	○2	○3	○4	○5	○6	○7
VE8	Tomatoes, tomato sauce, or salsa	○0	○1	○2	○3	○4	○5	○6	○7
VE9	Corn or hominy	○0	○1	○2	○3	○4	○5	○6	○7
VE10	Cucumbers	○0	○1	○2	○3	○4	○5	○6	○7
VE11	Jicama	○0	○1	○2	○3	○4	○5	○6	○7
VE12	Lettuce or salad greens	○0	○1	○2	○3	○4	○5	○6	○7
VE13	Spinach or other dark greens	○0	○1	○2	○3	○4	○5	○6	○7
VE14	French fries, fried potatoes, tater tots, home fries, or hash browns	○0	○1	○2	○3	○4	○5	○6	○7
VE15	Potatoes, boiled, mashed, or baked	○0	○1	○2	○3	○4	○5	○6	○7
VE16	Sweet potato	○0	○1	○2	○3	○4	○5	○6	○7
VE17	Avocado	○0	○1	○2	○3	○4	○5	○6	○7
VE18	Peas or lima beans	○0	○1	○2	○3	○4	○5	○6	○7
VE19	Mixed vegetables	○0	○1	○2	○3	○4	○5	○6	○7

The next group of foods is protein foods. How many times in the past week did your child eat:

		0	1	2	3	4	5	6	7+
IR1	**Egg**	○0	○1	○2	○3	○4	○5	○6	○7
IR2	**Dark meat chicken**	○0	○1	○2	○3	○4	○5	○6	○7
IR3	**Beef**	○0	○1	○2	○3	○4	○5	○6	○7
IR4	**Liver**	○0	○1	○2	○3	○4	○5	○6	○7
IR5	**Cooked beans or lentils**	○0	○1	○2	○3	○4	○5	○6	○7
IR6	**Peanut butter**	○0	○1	○2	○3	○4	○5	○6	○7

The next group of foods is cereals and grains. How many times in the past week did your child eat:

		0	1	2	3	4	5	6	7+
IR7	**Unsweetened cereal, cold or hot** (such as Cheerios, Kix, plain oatmeal, cream of wheat)	○0	○1	○2	○3	○4	○5	○6	○7
IR8	**Sweetened cereal, cold or hot** (such as Fruit Loops, Cocoa Puffs, Frosted Flakes, flavored oatmeal)	○0	○1	○2	○3	○4	○5	○6	○7
IR9	**Iron fortified bread or grains**	○0	○1	○2	○3	○4	○5	○6	○7

The next group of foods is baked goods and sweets. How many times in the past week did your child eat:

		0	1	2	3	4	5	6	7+
SW1	**Baked goods** (such as cakes, cookies, pies, muffins, donuts, brownies)	○0	○1	○2	○3	○4	○5	○6	○7
SW2	**Waffles, pancakes, or French toast with syrup**	○0	○1	○2	○3	○4	○5	○6	○7
SW3	**Packaged cookies** (such as Nilla wafers, graham crackers, Maria cookie, animal crackers, Fig Newtons)	○0	○1	○2	○3	○4	○5	○6	○7
SW4	**Packaged cookies with added fat** (such as Oreos, Chips Ahoy, etc.)	○0	○1	○2	○3	○4	○5	○6	○7
SW5	**Chocolate and chocolate candy** (such as M&Ms, Snickers, chocolate bars, Hershey's kisses)	○0	○1	○2	○3	○4	○5	○6	○7
SW6	**Fruit candy** (such as fruit snack, piñitas, candies fruit, fruit roll-ups)	○0	○1	○2	○3	○4	○5	○6	○7
SW7	**Lucas candies**	○0	○1	○2	○3	○4	○5	○6	○7
SW8	**Other candy** (such as Skittles, licorice, push pops, lollipops)	○0	○1	○2	○3	○4	○5	○6	○7
SW9	**Bubble gum**	○0	○1	○2	○3	○4	○5	○6	○7
SW10	**Jello**	○0	○1	○2	○3	○4	○5	○6	○7
SW11	**Popsicles**	○0	○1	○2	○3	○4	○5	○6	○7

The next group of foods is snack foods. How many times in the past week did your child eat:

		0	1	2	3	4	5	6	7+
SN1	**Chips** (potato or corn chips, Cheetos, Tortilla chips, pork skins, spicy chips, etc.)	○0	○1	○2	○3	○4	○5	○6	○7
SN2	**Goldfish**	○0	○1	○2	○3	○4	○5	○6	○7
SN3	**Crackers**	○0	○1	○2	○3	○4	○5	○6	○7
SN4	**Popcorn**	○0	○1	○2	○3	○4	○5	○6	○7

The last group is drinks. How many times in the past week did your child have:

		0	1	2	3	4	5	6	7+
DR1	**Non-diet soft drinks** (pop, soda, cola)	○0	○1	○2	○3	○4	○5	○6	○7
DR2	**Fruit-flavored punch or non-carbonated beverages** (Kool-Aid, V8 Splash, Capri Sun, Gatorade, Tampico, flavored water)	○0	○1	○2	○3	○4	○5	○6	○7
DR3	**Instant-breakfast drink**	○0	○1	○2	○3	○4	○5	○6	○7
DR4	**Pediasure**	○0	○1	○2	○3	○4	○5	○6	○7
DR5	**Water**	○0	○1	○2	○3	○4	○5	○6	○7

USDA8a. **Does he/she drink 100% fruit juice daily?**

○2 Always ○1 Sometimes ○0 Never

USDA8b. *If yes,* **About how many <u>ounces</u> of juice does he/she usually drink each day?** _____

MM1. **What did you feed your child for his or her main meal yesterday?**

_____
_____
_____
_____
_____
_____
_____

The next five questions are about things that people sometimes think about when choosing what to feed their child. Please fill in the bubble to show how much each thing affected your decision on what to feed your child yesterday.

		Not at all	A little	A lot
MM2a.	It was in your house –	○0	○1	○2
MM2b.	It was quick and easy to prepare	○0	○1	○2
MM2c.	You knew it would not go to waste	○0	○1	○2
MM2d.	The calories, vitamins, minerals, sugar, and/ or fat in the food	○0	○1	○2
MM2e.	Your child likes it	○0	○1	○2

The next questions are about the food eaten in your household in the last 12 months and whether you were able to afford the food you need. Please read the items carefully and fill in the bubble that best describes your answer.

USDA6. **Do you run out of food before the end of the month because you can't afford to buy more?**

○2 Always ○1 Sometimes ○0 Never

USDA7. **Do you worry that you will run out of food before you can afford to buy more?**

○2 Always ○1 Sometimes ○0 Never

The next nine questions are about feeding your child fruits and vegetables. Given the way your life is now, how sure do you feel that you can do each of these things? Please read the items carefully and fill in the bubble that best describes your answer.

		I don't feel sure	I feel a little sure	I feel fairly sure	I feel very sure
SE1.	How sure are you that you can afford to buy vegetables?	○ 0	○ 1	○ 2	○ 3
SE2.	How sure are you that you know which vegetables to buy for your child?	○ 0	○ 1	○ 2	○ 3
SE3.	How sure are you that you can make vegetables in ways that your child will like?	○ 0	○ 1	○ 2	○ 3
SE4.	How sure are you that you can serve your child one new vegetable each week?	○ 0	○ 1	○ 2	○ 3
SE5.	How sure are you that your child will eat the vegetables you serve?	○ 0	○ 1	○ 2	○ 3
SE6.	How sure are you that you can buy more fresh fruit in place of chips, crackers, candy and cookies?	○ 0	○ 1	○ 2	○ 3
SE7.	How sure are you that you can give your child fruits and vegetables at snack time?	○ 0	○ 1	○ 2	○ 3
SE8.	How sure are you that your child will eat fruits and vegetables at snack time?	○ 0	○ 1	○ 2	○ 3
SE9.	How sure are you that you can get fruit for your child instead of French fries when you eat out?	○ 0	○ 1	○ 2	○ 3

The following questions about your home environment related to what you and your child eat. Please read the questions carefully and fill in the bubble that best fits your answer for each question.

	ITEM	RATING				
		Never	Rarely	Sometimes	Often	Always
HN1.	I like to eat fruits.	○0	○1	○2	○3	○4
HN2.	I like to eat vegetables.	○0	○1	○2	○3	○4
HN3.	I like to try different fruits and/or vegetables.	○0	○1	○2	○3	○4
HN4.	I choose fruits in my meal when eating out.	○0	○1	○2	○3	○4
HN5.	I choose vegetables in my meal when eating out.	○0	○1	○2	○3	○4
HN9.	I include fruits and/or vegetables in meals for my child at home.	○0	○1	○2	○3	○4
HN10.	I include fruits and/or vegetables in snacks for my child at home.	○0	○1	○2	○3	○4
HN12.	I have time to fix vegetable dishes on most days of the week.	○0	○1	○2	○3	○4
HN13.	My child sees me eating fruit and/or vegetables.	○0	○1	○2	○3	○4
HN14.	I have to force my child to eat fruits and/or vegetables.	○0	○1	○2	○3	○4
HN15.	I make sure that my child eats vegetables before he/she can eat dessert.	○0	○1	○2	○3	○4
HN16.	I sit with my child while he/she eats meals.	○0	○1	○2	○3	○4
HN17.	My child likes to eat fruits.	○0	○1	○2	○3	○4
HN18.	My child likes to eat vegetables.	○0	○1	○2	○3	○4
HN19.	My child likes to try different fruits and/or vegetables.	○0	○1	○2	○3	○4
HN30.	It is easy to get my child to try new foods.	○0	○1	○2	○3	○4

HN33. **How often do you eat at fast food restaurants in a week?**

□ Never
□ 1 time/week
□ 2 times/week
□ 3 or more times/week

HN34. **How often do you cook at home in a week?**

□ Never
□ 1 time/week
□ 2 times/week
□ 3 or more times/week

HN35. **What is the main reason that you and your family eat at fast food restaurants?**

□ It is most convenient
□ It tastes good
□ It is more affordable
□ My child likes to eat there
□ Other: _____

HN36. **How many hours per day does your child watch television during a regular weekday?**

□ We do not have a television at home
□ None
□ Less than 1 hour per day
□ 1-2 hours per day
□ 3-4 hours per day
□ 5 or more hours per day

HN37. **How many servings of vegetables does your child eat on normal day?** _____

HN38. **How many servings of fruit does your child eat on a normal day?** _____

The following questions ask about the presence of fruit and vegetables in your home in the past week. Please circle yes or no for each question.

AV1. **Did you have 100% fruit juice in your home last week?**

Yes No

AV2. **Did you have vegetable juice in your home last week?**

Yes No

AV3. **Did you have fruit in your home last week?**

Yes No

AV4. **Did you have raw or cooked vegetables in your home last week?**

Yes No

AV5. **Did you have salad in your home last week?**

Yes No

AC1. **In the last week, were fruit and vegetables on your kitchen counter or somewhere in the open?**

Yes No

AC2. **In the last week, was 100% fruit juice or fruit on the front shelf of the refrigerator as a snack?**

Yes No

AC3. **In the last week, were cut up fresh vegetables on the front shelf of the refrigerator as a snack?**

Yes No

AC4. **In the last week, were there vegetables in the refrigerator that were prepared so they could readily be used in a meal?**

Yes No

Lastly, we would like to learn a little more about you.

DE1. How old are you? ☐☐ years

DE2. What is your sex?

○1 Male ○0 Female

DE3. What is your race or ethnicity (check all that apply)?

○1 White ○4 Asian or Pacific Islander

○2 Black ○5 Native American or Alaskan

○3 Hispanic or Latino ○6 Other (please describe): _____

DE4. What is the highest level of school you have finished?

○1 1st to 6th grade ○5 High school graduate

○2 7th to 9th grade ○6 Some college

○3 10th to 12th grade ○7 College graduate

○4 GED

DE5. Do you have a job?

○2 Yes, full-time ○1 Yes, part-time ○0 No

DE6. What is your marital status?

○1 Single, never married

○2 Married, or living as married

○3 Widowed

○4 Divorced

DE7. What is the main language you speak in your home?

○1 English ○2 Spanish ○3 Other (please describe):_____

DE8. How many people live in your household (including all kids)? ☐☐

DE9. Are you or your child enrolled in the Texas WIC program?

○1 Yes ○0 No

DE10. **If yes, other than WIC, does your family or your child participate in other food assistance programs such as food stamps, free lunch, or food pantries?**

○[1] Yes ○[0] No

DE11. **What is the total household income <u>per month</u> before taxes?**

○[1] $0-999 a month

○[2] $1,000-$1,999 a month

○[3] $2,000-$2,999 a month

○[4] $3,000-$3,999 a month

○[5] $4,000-$4,999 a month

○[6] $5,000- $5,999 a month

○[7] $6,000-$8,999 a month

○[8] $9,000 or more a month

○[88] Don't know

Appendix C: Twenty-Four Hour Food Recall Training Materials

PROCEDURES FOR COLLECTING 24-HOUR FOOD RECALLS

What is a 24 hour recall:

- The 24-hour recall is a dietary assessment instrument.
- The 24-hour recall is used to obtain information on food and fluid intake for the previous day or previous 24 hours.
- The 24-hour recall is based on the assumption that the intake described is **typical** of daily intake.
- We will be obtaining a parental proxy of what their child ate during the previous 24 hours.

Components of the 24-hour recall:

- The food or beverage item and a brief description of how the food was prepared
- Amount eaten of the food or beverage item
- Time or meal type in which the food or beverage was consumed
- Where the participant (child) ate the food or beverage item
- Any relevant notes to the meal or food item

ADDITIONAL QUESTIONS ON THE FORM:

Item 1. ID # (Survey Identification number)- This number is composed of the following information:

- Child's birth date (YYYYMMDD)
- Child's First name initial
- Child's Last name initial
- First 2 letter of the place where the data collection took place in this case HS (Head Start)

Example: For a child whose name is Diego Hernandez born November 2nd, 2004. The ID# would be: 20041102DHHS

Item 2. Date- (Self explanatory) Date the 24-hour recall was taken.

Item 3. Interviewers Initials- (Self explanatory) Your First and Last name initials only.

Item 4. Nutritional Supplements- Ask participant if his/her child takes any nutritional supplements and mark the appropriate bubble. If the child takes nutritional supplements please ask which ones and write them down. Please ask if they know what is in them.

Example: "Femiron"- Iron supplement. "Flintstone vitamins"- multivitamin.

Item 5. Average physical activity for child- Some people might have trouble estimating the amount of physical activity the child gets. You may ask them to think compared to other children how active they think the child is and if they think the child accumulates less than 30 minutes, 30 to 60 minutes or more than 60 minutes each day.

Example: A very active child probably accumulates 60 minutes of physical activity on a daily average.

Item 6. What did your child eat and drink in the last 24-hours? <u>The actual 24-hour recall.</u>

When taking a 24-hour recall, it is important for the interviewer to follow certain procedures to insure the following:

- That all foods and beverages consumed are listed.
- That all amounts of foods eaten are as accurate as possible.
- That the participant is not influenced to say his/her child ate foods that were not eaten.

Setting the stage for the interview

The following steps will help in eliciting truthful and complete information:

1. Explain to the parent participant that you need to know only what his/her child actually ate. She/he should not feel embarrassed about any food, as there are no "good" or "bad" foods. No one eats just the right foods all the time.
2. Do not express in words or facial expressions either approval or disapproval of foods which the participant mentions.
3. Do not ask leading questions that would lead the participant to feel she/he "should" have had a certain item and, thus, say she/he did.

During the food recall interview

A note about ***Food items and descriptions*** section:

- You will have food portion models to guide you in determining the actual amount of the food/beverage consumed. When providing a description of a food, such as, a mixed dish, salads or casseroles list the food and then ask about the ingredients in that particular food. If food was eaten in a restaurant, record the name or type of restaurant.

- Start the interview by asking **what the child ate for breakfast this morning?** Which we will consider the **most recent meal or snack** that the child consumed and we will work backwards to cover all foods and beverages eaten or drunk in the last 24 hours. Essentially today's' breakfast, yesterday's dinner, yesterday's snacks (afternoon and morning maybe late night or before bedtime) and yesterday's lunch.

1. First, get a complete **list of all foods eaten and fluid intake** without trying to determine amounts. Simultaneously fill out the 5th column "meal type/time".
Use the following types of probes to find **what foods and when** they were eaten:

A. Opening question: "*What did your child eat for breakfast?"*
B. Then probe about time.
   Examples:
   "At what time was this? Did your child eat or drink anything before or after that?"
   "What did he/she have at that time?"
C. **Then go through each meal type:** "What did your child eat for dinner last night?" "Did your child eat any snacks?" "What did your child have for lunch yesterday?"
D. Then probe about activities the child does and ask if he ate something **before, during or after** the activity. Sample activities may be: drawing, watching TV, playing, going to the park, etc.
E. The next type of probe tries to get more complete information about foods already reported. Go back to the list and ask: "Do you remember anything else that your child ate or drank with this food?" "What else did your child have at this meal?" "Was the (bread, vegetable) eaten plain or did you put something on it?" "Did your child have a second helping?"

2. After all foods are named by the participant, go back over the list to get additional descriptions and **amounts** of the food.

a. Encourage the participant to describe foods as clearly as possible.
b. Ask participants to describe combination dishes carefully. Mixtures such as sandwiches, soups, stew, pizza, casseroles, etc. can be prepared in many ways. You may have to restate questions to get more information.
c. Ask about packages, pre-packaged food, record band names, and other pertinent information.

Determine the amount of food eaten. Use the food models to guide you through the portion eaten by the child. Ask if all of the food was eaten or if some was left on the plate. Amounts of a food may be given in:

i. NUMBERS, such as eggs, donuts, apples

ii. SHAPES, such as a pat of butter, stalk of celery, slice of pie (or the shapes included at the end of this section.)
iii. DIMENSIONS, such as portion of food model, or size.
iv. VOLUME, such as liquids, cooked vegetables, pudding, ice cream
v. WEIGHT, such as meat, cheese, candy bar, (3 oz. meat equals size of deck of cards, or palm of a woman's hand).

3. Go back over the list and ask where the food was eaten.
4. After the participant has given a recall of foods and amounts for the entire 24 hours, read the list back to him/her and ask the participant to tell you anything else that his/her child may have ate that he/she might have forgotten before.
5. Thank the participant for his/her cooperation. Do not comment on the recall at this time, unless the participant asks a specific question.

Note: If nutrition questions are being asked by the participant during the time the recall is being taken, ask the participant if you may answer them later when you have completed the recall. **You may answer the question if you feel comfortable doing so. If not please refer the participant to me and I will answer his/her question.**

MULTI-STEP 24 HOUR FOOD RECALL (In person interview)

1. ID #:	**2. Date:**	**3. Interviewers Initials:**

4. Nutritional Supplements: ○ 1 Yes ○ 0 No If yes, list type:	**5. On average how much physical activity does your child get a day?** ○ 0 Less than 30 minutes ○ 2 More than 60 minutes ○ 1 30 to 60 minutes
MEAL TYPE Morning = 1 Afternoon= 4 Midmorning = 2 Evening =5 Noon = 3 Late Evening = 6	**SERVING ABBREVIATIONS** Tbsp = tablespoon c = cup tsp = teaspoon lb = pound oz =ounce sl =slice fl oz = fluid ounce

TO BE CODED BY STAFF		**6. What did your child eat and drink in the last 24 hours?**			
Food ID Number	**Amount Code**	**Food Items and Descriptions**	**Amount eaten**	**Meal type/ time**	**Where?**

Comments:

MULTI-STEP 24 HOUR FOOD RECALL (SAMPLE FILLED OUT)

1. ID #: 2004110204DHMF	2. Date: 11-14-07	3. Interviewers Initials: JL

4. Nutritional Supplements:	55. On average how much physical activity does your child get a day?
○1 Yes ○0 No If yes, list type:	○0 Less than 30 minutes ○2 More than 60 minutes ○1 30 to 60 minutes

MEAL TYPE		SERVING ABBREVIATIONS	
Morning = 1	Afternoon= 4	Tbsp = tablespoon	c = cup
Midmorning = 2	Evening =5	tsp = teaspoon	lb = pound
Noon = 3	Late Evening = 6	oz =ounce	sl =slice
		fl oz = fluid ounce	

TO BE CODED BY STAFF		6. What did your child eat and drink in the last 24 hours?			
Food ID Number	**Amount Code**	**Food Items and Descriptions**	**Amount eaten**	**Meal type/ time**	**Where?**
		Waffles	1 sl	1	Home
		Whole wheat store bought frozen HCF		1	Home
		Maple syrup Crackle Barrel	1 Tbsp	1	Home
		100% Fruit juice box COSTCO	6 oz	1	Home
		Lasagna with meat sauce store bought Marie Calendars	½ c.	5	Home
		Cucumber slices	½ c.	5	Home
		Pear	1-2 sl	5	Home
		Chocolate kisses	4 piece	5	Home
		Breakfast Taco homemade		3	School
		Whole wheat tortilla	1 sl	3	School
		Scrambled egg	1 piece	3	School
		Cheese mozzarella HEB	½ oz	3	School
		Ham black forest HEB	1 sl	3	School
		Butter	1 tsp	3	School
		Grapes green	¾ c.	2	School
		Forgotten items			
		Chocolate chip cookies (snack bag)	1 pk.	4	Home
		100% Fruit juice box COSTCO	6 oz	4	Home

Comments: Mom feels child eats a lot.

Appendix D: IRB Approval Letter

OFFICE OF RESEARCH SUPPORT

THE UNIVERSITY OF TEXAS AT AUSTIN

P.O. Box 7426, Austin, Texas 78713 (512) 471-8871 - FAX (512 471-8873)
North Office Building A, Suite 5.200 (Mail code A3200)

FWA # 00002030

Date: **06/30/08**

PI(s):**Nell H Gottlieb**	Department & Mail Code:	**KINESIOLOGY & HEALTH-BEL**	**D3700**
Jennifer Loyo		**KINESIOLOGY & HEALTH-BEL**	**D3700**
Tara C Ray		**KINESIOLOGY & HEALTH-BEL**	**D3700**

Dear: **Nell H Gottlieb** **Jennifer Loyo** **Tara C Ray**

IRB APPROVAL – IRB Protocol # **2007-05-0086**

Title: **Reproducibility and Validity of the 'Feeding Your Preschooler Questionnaire For Ethnically Diverse Populations**

In accordance with Federal Regulations for review of research protocols, the research study listed above has been re-approved for the following period of time:

Your research study has been re-approved from 07/09/2008 - 07/07/2009

RESPONSIBILITIES OF PRINCIPAL INVESTIGATOR FOR ONGOING PROTOCOLS:

(1) Report **immediately** to the IRB any unanticipated problems.

(2) Proposed changes in approved research during the period for which IRB approval cannot be initiated without IRB review and approval, except when necessary to eliminate apparent immediate hazards to the participant. Changes in approved research initiated without IRB review and approval initiated to eliminate apparent immediate hazards to the participant must be promptly reported to the IRB, and reviewed under the unanticipated problems policy to determine whether the change was consistent with ensuring the participants continued welfare.

(3) Report any significant findings that become known in the course of the research that might affect the willingness of subjects to continue to take part.

(4) Insure that only persons formally approved by the IRB enroll subjects.

(5) Use **only** a currently approved consent form (remember approval periods are for 12 months or less).

(6) **Protect the confidentiality of all persons and personally identifiable data, and train your staff and collaborators on policies and procedures for ensuring the privacy and confidentiality of participants and information.**

(7) Submit for review and approval by the IRB all modifications to the protocol or consent form(s) prior to the implementation of the change.

Protocol #	**Approval dates:**
2007-05-0086	**07/09/2008 - 07/07/2009**

(8) Submit a **Continuing Review Report** for continuing review by the IRB. Federal regulations require **IRB review of on-going projects no less than once a year** (a Continuing Review Report form and a reminder letter will be sent to you 2 months before your expiration date). Please note however, that if you do not receive a reminder from this office about your upcoming continuing review, it is the primary responsibility of the PI not to exceed the expiration date in collection of any information. Finally, it is the responsibility of the PI to submit the Continuing Review Report before the expiration period.

(9) Notify the IRB when the study has been completed and complete the Final Report Form.

(10) Please help us help you by including the above protocol number on all future correspondence relating to this protocol.

Thank you for your help in this matter.

Sincerely,

Jody Jensen, Ph.D., IRB Chair

Protocol # Approval dates:

2007-05-0086 **07/09/2008 - 07/07/2009**

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